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Vol. 42 **OCTOBER, 1956** **No. 10**

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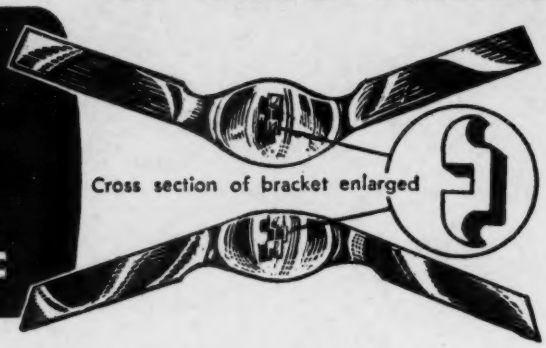

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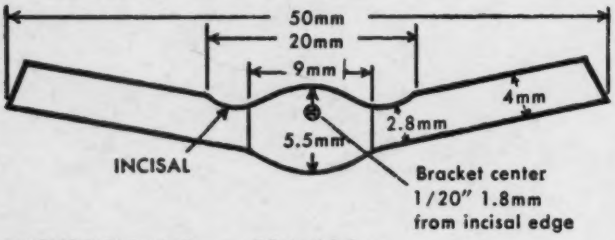

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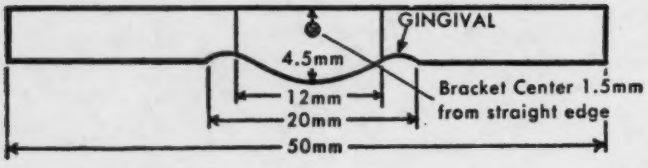

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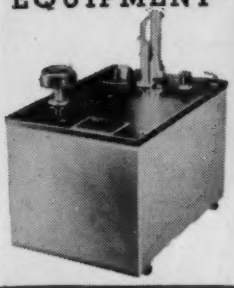

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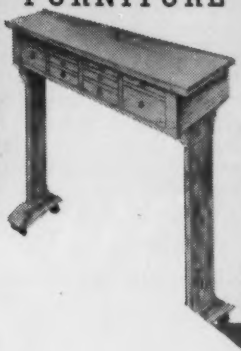

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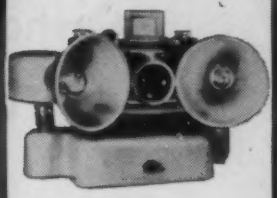

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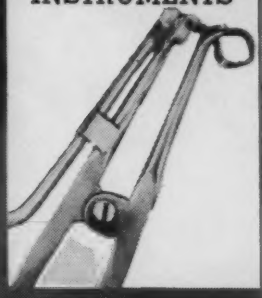

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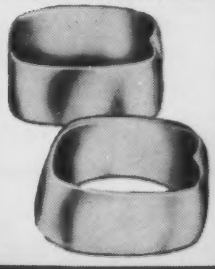

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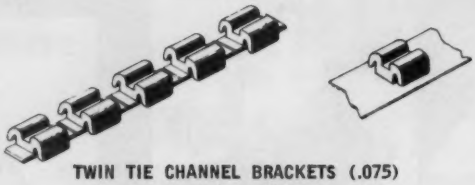

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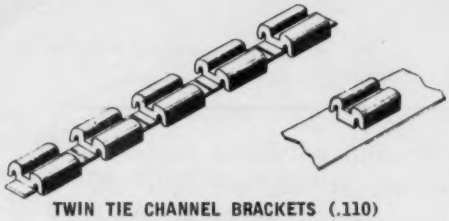

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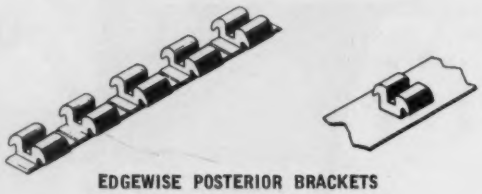

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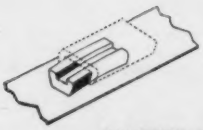

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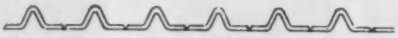

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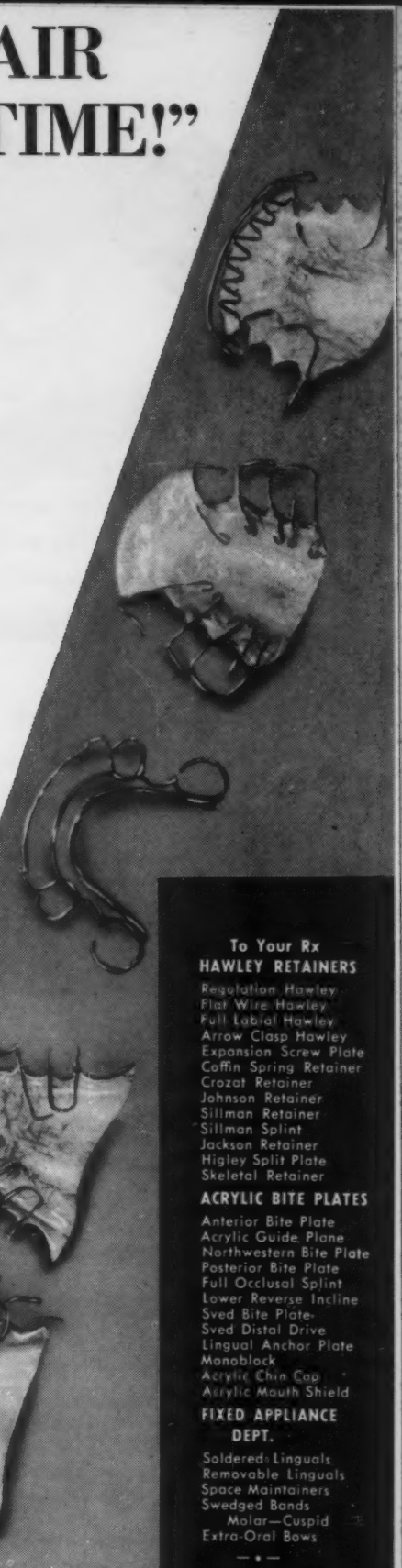

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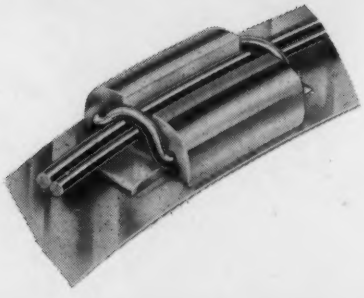

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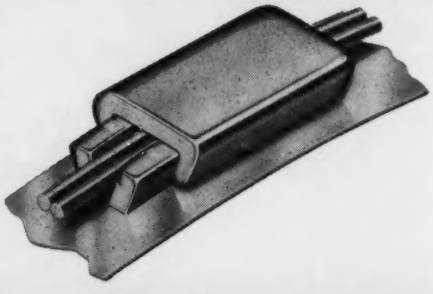

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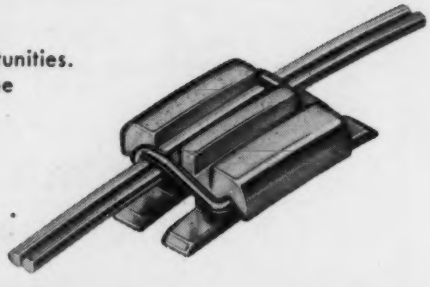

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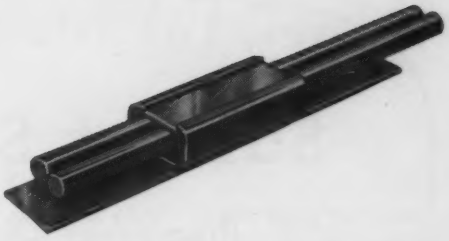

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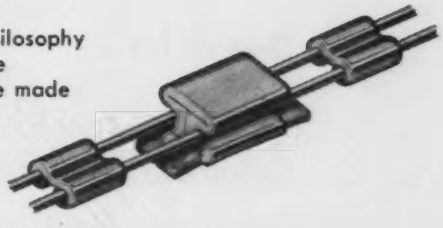

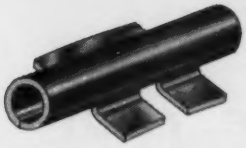

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- D. State Supervision and Control of the Profession

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- B. Negligence and Contributory Negligence
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3—COMPENSATION FOR DENTAL SERVICES IN GENERAL
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- B. Partners and Partnerships

9—INJURY TO THOSE OTHER THAN PATIENTS

10—THE DENTIST AS A WITNESS
- A. Dentist as Lay Witness
- B. Dentist as Expert Witness

by

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Ph.B., J.D., LL.M., JUR. Sc.D.

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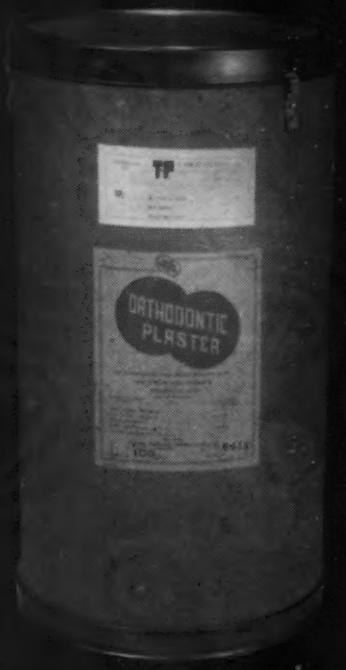

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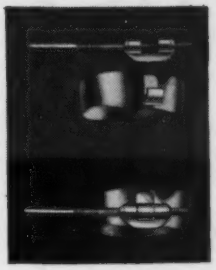

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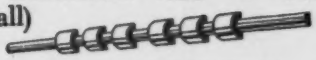

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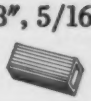

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Practice Administration for THE DENTIST

Edited by **WILLIAM R. MANN, M.S., D.D.S.**, Ann Arbor, Michigan. Associate Professor of Dentistry, School of Dentistry, and Associate Director, W. K. Kellogg Foundation Institute; Graduate and Postgraduate Dentistry, University of Michigan.

and **KENNETH A. EASLICK, A.M., D.D.S.**, Ann Arbor, Michigan. Professor of Dentistry, School of Dentistry, University of Michigan.

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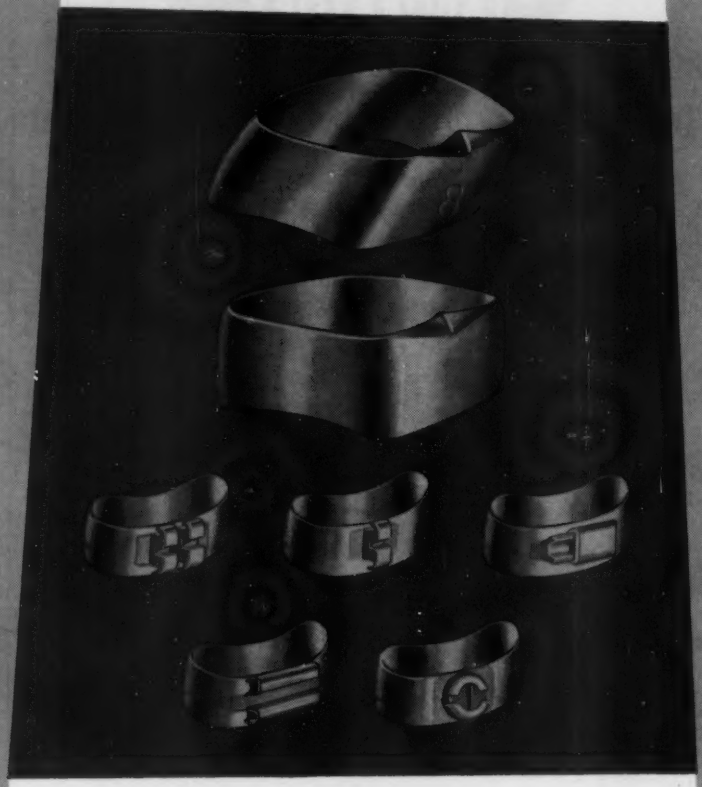

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American Journal

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ORTHODONTICS

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VOL. 42 OCTOBER, 1956 No. 10

Original Articles

PRESIDENT'S ADDRESS, AMERICAN ASSOCIATION OF ORTHODONTISTS

PHILLIP E. ADAMS, D.M.D., BOSTON, MASS.

IN CONFORMITY with precedent and the dictates of the by-laws, it is the duty of the president to deliver an annual address before the Association. It would seem that the purpose of such an address should be to acquaint you with some of the more important matters concerning our Association and to make such suggestions and recommendations as may seem pertinent toward the improvement of the Association's effectiveness.

At the last annual session in San Francisco, several important actions were taken which will come up for final consideration at this meeting.

Two special committees were appointed—one to study the feasibility and advisability of creating a Ladies Auxiliary of the American Association of Orthodontists and one to study the matter of improving methods whereby patients may be transferred from one orthodontist to another.

Certain directives were given the Committee on Education of the American Association of Orthodontists relative to making a survey of the orthodontic curricula in dental schools wherein those curricula are longer than 1,500 hours. In addition, a special advisory committee to the Committee on Education was authorized to assist in this proposed survey.

As most of you are aware, the so-called 1,500-hour amendment was adopted at the San Francisco meeting in 1955 to go into effect two years from the

Presented before the annual meeting of the American Association of Orthodontists, Boston, Massachusetts, May 1, 1956.

date of its adoption. This amendment, when effective, will supplant the existing requirements for membership.

That amendment provides, as you may recall, that "A person who has been in the exclusive practice of orthodontics for at least three years and has successfully completed an orthodontic course of a minimum of 1,500 hours in an approved dental school and is a member in good standing in his local, state and national dental organizations may be elected to active membership through the constituent society. He must be recommended by two active members." After the amendment was passed, a special committee of five was authorized to consider further the requirements for membership in the American Association of Orthodontists.

The majority of the members of this committee have agreed on a proposed amendment which will provide a method of strong, rigidly controlled preceptorship as an alternate method of orthodontic training to qualify for membership in the American Association of Orothodontists.

The personnel of these various special committees appears in your program. I am sure you will agree that these matters are in competent hands. The reports of these committees, together with the comments and recommendations of the Board of Directors, will be presented to you at the coming business meetings. The final responsibility for action on these reports rests with you, the membership. I bespeak your active participation in their consideration; it is a privilege and a duty of membership.

You have received, through the Secretary's letter, copies of the important amendments to the bylaws introduced at the last annual session. They will be acted upon at the business meetings of this session. They deserve your careful attention.

In addition to the report of the Constitution and By-laws Committee, the other eleven standing committees will have reports. The recommendation of these committees, together with comments from the Board of Directors, will be brought to you at the business meetings. One of these reports which I was privileged to preview, that of the Public Health Committee, relates to the proposal, introduced several years ago, that the American Association of Orthodontists undertake a national survey in public health orthodontic care. The Committee's report is most inclusive; nevertheless, important decisions must be made regarding the type, scope, and methods of handling such a project.

The report of the Publications and Editorial Board indicates that 1955 was a most successful year for the AMERICAN JOURNAL OF ORTHODONTICS. The adoption of the pending amendments to the bylaws plus a new contract with the publishers of the JOURNAL, should do much, as the report states, "to assure lasting stability to the whole journalistic enterprise of the Association and mark the beginning of a new era of growth, built upon a strong editorial policy and a workable business management program."

The sketchy outline of these two reports should be enough to emphasize the fact that all your committees are actively engaged throughout the year

in furthering your interests and carrying out their assignments; their reports are the culmination of their efforts in your behalf.

FEDERAL TRADE COMMISSION

Early in the summer of 1955, we were informed that the Federal Trade Commission would hold a public hearing in Washington, D. C., on June 24, 1955, on "Proposed Trade Practice Rules for the Commercial Dental Laboratory Industry." We also learned that these proceedings were instituted pursuant to an industry application.

After consultation with members of the Public Relations Committee and the secretary-treasurer of the American Association of Orthodontists, it was decided to have counsel represent the American Association of Orthodontists at the hearing. We were represented by Mr. John G. McCune, who was quite familiar with Association policy and thoughts in such matters, having been one of our counsel in the Federal Trade Commission action against the American Association of Orthodontists in 1953.

The American Dental Association was represented by Dr. Walter E. Dundon, chairman of the American Dental Association Council on Dental Trade and Laboratory Relations. Accompanying him were Mr. Bernard J. Beasley, secretary of the above Council, and Mr. Bernard J. Conway, secretary of the American Dental Association Council on Legislation.

The American Dental Association's opposition to the definition of the industry and to Rule 1 goes to the question of whether or not a dental laboratory designs the various types of prosthetic dental appliances, orthodontic corrective appliances, etc. The American Dental Association took the position that only a licensed dentist may design and that it is the function of the dental laboratory to fabricate and process, according to such design.

Mr. McCune, on behalf of the American Association of Orthodontists, stated that the American Association of Orthodontists was in agreement with the position taken by the American Dental Association in general, and specifically as to the use of the word "design" in the definition. Mr. McCune further stated that it was the position of the American Association of Orthodontists that only a licensed practitioner could design orthodontic corrective appliances since the original design of such appliance is prospective in nature in that it is used not only to retain but as a basis for the movement of teeth and must necessarily include the prescription for treatment, which function is absolutely limited to the practice of dentistry in which dental laboratories are not licensed to engage.

The persons present on behalf of the dental laboratories were not at all enthused about orthodontic work, since they agreed that the dentist should be the designer of orthodontic corrective appliances. They complained, however, that they are not in a position to refuse to fabricate, process, or design orthodontic appliances when a dentist makes such a request and they pointed out that, although it may not be good practice for a dentist to farm out his orthodontic work, control of such practice is the duty of the dental profession and not of the dental laboratories.

A few weeks after the hearing, we were informed that the Federal Trade Commission would consider additional evidence and information relative to the proposed code from interested parties. A letter was drafted, which was approved by Mr. McCune, submitted to the Ad Interim Committee of the American Association of Orthodontists for their approval, and forwarded to the Federal Trade Commission. This letter basically approved the statements of Mr. McCune and the American Dental Association as presented at the hearing and, in addition, pointed out some of the biologic reasons which made it mandatory that the designing of an orthodontic appliance should be restricted to a licensed practitioner.

When the *Trade Practice Rules for the Commercial Dental Laboratory Industry,* as promulgated by the Federal Trade Commission, Nov. 4, 1955, became available it was apparent that the recommendations of the American Association of Orthodontists and the American Dental Association had been given little consideration. A footnote on the word "design" in the statement by the Commission defining the industry states: "The ultimate responsibility for design is that of the dentist."

In an attempt to get clarification on this footnote, your president wrote the Federal Trade Commission, asking for interpretation and specifically asking whether a laboratory that designed an appliance without a prescription from a dentist would be violating the *Trade Practice Rules.* Recently I received a communication from the attorney of the Commission, from which I quote: "You ask whether the footnote to the word 'design' in the Commission statement, reading 'The ultimate responsibility for design is that of the dentists,' means that a laboratory cannot design an appliance. The sole purpose of paragraph 2 of the Commission statement of which the footnote is a part, is to define the industry to which the rules have applicability. Therefore, neither the rules nor the Commission statement supply an answer to your question, and I have found no Commission ruling on the point." Apparently there is no prohibition to the design of appliances by a laboratory.

At the April meeting of the Board of Trustees of the American Dental Association, in response to several resolutions regarding the Federal Trade Commission's *Trade Practice Rules* submitted by constituents of the American Dental Association, the following action was taken:

Committee C presents the following for action by the Board of Trustees:

400. *Resolved,* that the Council of Dental Trade and Laboratory Relations be directed:

1. To seek amendment of the *Trade Practice Rules* for the Commercial Dental Laboratory Industry of the Federal Trade Commission to indicate that the responsibility for the design, appearance, comfort, occlusion, or fit of a prosthetic dental appliance rests with members of the dental profession and not with the dental laboratory craft.
2. To seek amendment of the *Rules* so that they will clearly describe the proper relation of the dental laboratory to the dentist by declaring that only licensed dental practitioners and other persons authorized by state law may properly deal with dental laboratories.

3. To refrain from cooperating in the enforcement of the *Rules*, or in promoting the *Rules*, until satisfactory amendments have been presented and approved by the Board of Trustees and House of Delegates.
4. To consider making appropriate recommendations on the possibility of revoking or enjoining the *Rules* if satisfactory amendment has not been made prior to the 1956 annual session.
5. To make its progress in this matter the subject of full report to the August, 1956, session of the Board of Trustees and the annual session of the House of Delegates, and be it further

Resolved, that the statement of the Committee be transmitted to the constituent societies involved in the presentation of Resolutions 5, 9, 30, 35, and 37.

The Committee also presents the following resolution for action by the Board of Trustees:

401. *Resolved*, that the sum of $2,500.00 be appropriated from the contingent fund to the budget of the Council on Dental Trade and Laboratory Relations for expenses involved in seeking amendment of *Trade Practice Rules* for the Dental Laboratory Industry of the Federal Trade Commission, and be it further

Resolved, that the expenditure of the appropriated funds be administered by the Secretary of the Association.

I regret that it was necessary to use so much time in presenting this matter, but I believe that this may well be one of the most important events occurring during this administrative year.

Your Public Relations Committee is alert, and you may be assured that in any emergency it will act promptly and effectively. The bylaws make provision for interim action as might arise between sessions. However, I think that it might be well for the Association to take formal specific action in regard to this matter, instructing the Public Relations Committee and your incoming officers to cooperate with the American Dental Association in every way possible, the American Dental Association to be informed officially of such action as may be taken at this meeting.

WORKSHOP ON CEPHALOMETRICS

Several months ago, Dr. Salzmann suggested that it might be desirable to appoint a committee to explore the possibility of holding a workshop on cephalometrics under the auspices of the American Association of Orthodontists, the purposes of such a workshop would be, briefly: to standardize technique, to clarify interpretation, and to evaluate clinical application in the field of cephalometrics.

After prior consultation with the secretary as to the propriety of appointing such a committee, and with the explicit understanding that no financial commitment would be involved on the part of the American Association of Orthodontists, your president appointed the following committee: Allan G. Brodie, Sr., L. Bodine Higley, J. A. Salzmann (Chairman), and Wilton M. Krogman (Consultant). Their report will be considered by the Board of Directors and their recommendations transmitted to you at the business meeting.

To one who has been privileged to serve a number of years on the Board of Directors and as your president-elect and president, there is a strong temptation to indulge in prolific recommendations for the alleged improvement of the Association. However, I shall limit myself to one specific recommendation, which I hope will prove worth while.

To those of us who attend the sessions of the American Association of Orthodontists year after year, the production of the program, both scientific and social, is a fait accompli. If we give the matter any thought, we recognize that it involved work and planning on someone's part, but how much do we not know. It is only when one has the opportunity to participate actively in the creation of our programs that he has a full realization of the tremendous amount of time and energy which goes into them. While we have a basic pattern for our sessions which comes down from year to year, actually each program is highly individualized by the dictates of the current officers, the Program Committee, and the Local Arrangements Committee. While it is desirable to provide for originality and ingenuity in the development of our programs, unless we have a basic pattern, design, or directive in regard to program planning it is understandable that many extra hours are expended in trial-and-error methods of arriving at a known objective and why conflicts and mistakes are inevitable.

I am certain that the Program Chairmen and Local Arrangements Chairmen of the last few years could, out of their triumphs and mistakes, furnish the necessary data to create a program manual which would do much to simplify program planning.

I therefore recommend that a committee be appointed consisting of the Program Chairmen and Local Arrangements Chairmen of the last three sessions and that they be directed to prepare a program manual for the guidance of those responsible for program planning in the future, such program manual to be approved by the Board of Directors and to be subject to amendment and revision by vote of the Board of Directors as necessity dictates.

In addition to the pure mechanics of setting up the scientific and social programs, attention should be given by this committee to the following:

1. Determination of Association policy regarding guest admission to the American Association of Orthodontists' meetings, whether restricted to orthodontists who are potential members or open to general practitioners interested in orthodontics who presumably will never specialize.

2. The relative place of exhibits in program planning; more open time if exhibits are to contribute materially to the support of the meeting.

3. Reassessment of existing policy regarding reimbursement, honoraria, and expenses of clinicians and essayists at our annual sessions.

4. Limitation of various parts of the program, lengthening of the time of the meeting, etc.

During the year, I visited three of the eight constituent societies—the Southern, Middle Atlantic, and Northeastern Societies of Orthodontists. I was forced by previous commitments to decline an invitation to attend the Great Lakes Society's meeting. I have followed with interest the activities of all constituent societies, and wish to congratulate them on the very significant contributions they are making to the advancement of this Association and of orthodontics as a specialty.

I extend my sincere thanks to all who have assisted in carrying out the activities of the Association during the past year. To my program chairman, C. Edward Martinek, my clinic chairman, Milton Meyers, my local arrangements chairman, Henry C. Beebe, and their efficient committees, I offer my very great appreciation for their steadfast and loyal support in carrying out their assignments.

I want to take this opportunity to thank all the essayists and clinicians for their significant contributions to the success of this meeting.

Also may I express, on behalf of the Association, our appreciation to our exhibitors for their assistance in making our meeting a success.

To the American Board of Orthodontics go our thanks and appreciation for their dedicated service in advancing the standards and standing of orthodontics.

To Leuman M. Waugh, the recipient of the 1955 Albert H. Ketcham Memorial Award, go our congratulations and best wishes.

It has been a pleasure to work with the officers of the Association: President-Elect A. C. Broussard, Vice-President Stephen C. Hopkins, Secretary-Treasurer Franklin A. Squires, Librarian Charles R. Baker, and Historian Leuman M. Waugh. I thank them for their splendid cooperation.

I should like also at this time to express, on behalf of both the Association and myself, our appreciation to one who, by her long and efficient service, has certainly become one of our official family—our reporter, Mrs. Augusta Grimm.

On behalf of the Association, I extend a hearty welcome to all our visitors from both at home and abroad. I trust that our foreign visitors will take back to their respective countries our greetings and felicitations.

And last, but not least, to you, my fellow members, go my sincere thanks for your attendance at this meeting, for your support throughout the year, and for affording me the privilege of serving as your president. It has been a rewarding experience and one I shall forever cherish.

SERIAL EXTRACTION AS A TREATMENT PROCEDURE

Z. Bernard Lloyd, D.D.S., Washington, D. C.

SERIAL extraction or the early removal of teeth, both deciduous and permanent, to relieve crowding and overlapping of the teeth in those patients who exhibit a severe lack of intercanine space or insufficient arch length has received scant attention in the orthodontic literature of this country. Very few articles have explored this particular subject; those that have seem to be dealing with a specific or localized area. Few, to my knowledge, have discussed the problem as a whole, that is, in both the maxillary and mandibular arches in relation to removal of deciduous teeth and eventually to removal of permanent teeth.

Serial extraction is not a new treatment procedure; until recent years, however, it has been used sparingly in this country.

Foster,[1] in his article entitled "An Analysis of the Developing Dentition," discussed the changes that occur in the mandibular arch after the removal of the mandibular deciduous canine in those cases showing a lack of intercanine space.

Kelly,[2] in an article entitled "Treatment in the Mixed Dentition," recommends the serial extraction of deciduous teeth in order to prevent and overcome rotations of the maxillary and mandibular incisors and to allow these teeth to assume their normal position in the basal bone.

Kjellgren,[3] of Sweden, and Heath,[4] of Australia, have practiced serial extraction for at least two decades, and have published many articles.

Lloyd,[5] in an article entitled "A Composite Case Report of Class I Malocclusions With Insufficient Arch Length," recommends serial removal of teeth, both deciduous and permanent, based on sequence of eruption of permanent teeth.

Dewel,[6] in an article entitled "Serial Extraction in Orthodontics; Indications, Objectives, and Treatment Procedures," covers the subject thoroughly and includes research investigations on developmental areas.

There may be other articles in the orthodontic literature of this country dealing with the early or serial removal of teeth, but little has been published on this subject.

What Is Serial Extraction?—It may be called the early recognition or anticipation of a deformity that will occur unless teeth are removed at strategic intervals to relieve in intensity the developing malocclusion.

Read before the American Association of Orthodontists, Boston, Massachusetts, May, 1956.

By the timely removal of teeth in developing dentures that show severe deficiency in arch length or intercanine space, it allows unerupted, erupting, or erupted teeth to guide themselves to improved positions.

Most practitioners defer the removal of premolar teeth until the complete eruption of the teeth, with the exception of the third molars. After practicing this concept for a number of years and using sectional arch wires for canine retraction after premolar removal, I felt that earlier decisions could be made that would eliminate much mechanical tooth movement.

What Malocclusions Qualify for Serial Extractions?—All types of Class I malocclusions and Class II, Division 1 malocclusions that show a severe lack of arch length or severe lack of intercanine space in both the mandible and the maxillae may be treated by serial extraction.

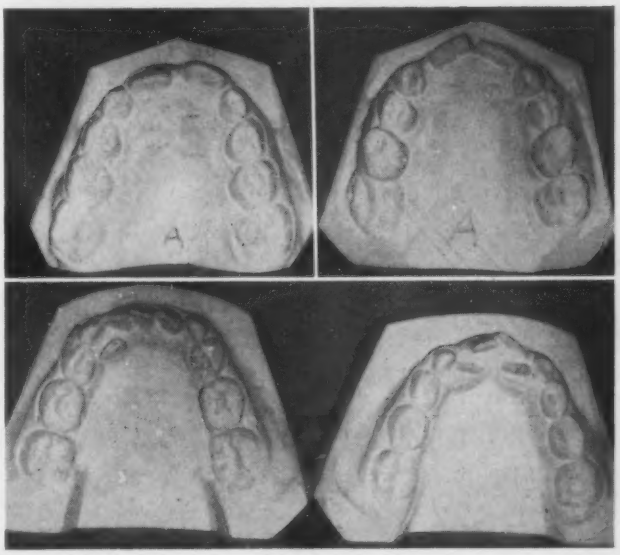

Fig. 1.—Typical case showing severe lack of intercanine space with resultant irregularity of maxillary and mandibular incisors.

Contra-indications.—Class I malocclusions that show lack of intercanine width in varying degree in the mandibular arch, with adequate arch length in the maxillae, do not qualify for serial extraction, and those Class I malocclusions that show a slight lack of intercanine width in both maxillary arch and mandibular arch should not be treated by serial extraction procedures. Beneficial results are doubtful in most Class II, Division 2 and Class III malocclusions. Also, when there is an unusual breakdown of first permanent molars, loss of one or more first permanent molars, the congenital absence of second premolars, or their malformation, the typical serial extraction procedure must be altered.

The type of case that lends itself to the most favorable adjustments by serial extraction, without early appliance therapy, is the Class I malocclusion that shows a severe lack of intercanine space in both jaws to accommodate the incisor teeth in nonrotated positions. In these malocclusions, the axial inclinations of the central incisors, both maxillary and mandibular, are within the

accepted range of normal; they are further characterized by a good facial profile; the overbite ranges from slight to severe; the age of the patient is somewhere between 6 and 9 years of age.

The etiological factors in these cases are usually attributed to heredity, lack of sufficient growth and development or, as we frequently hear, teeth that are too large and jaws that are too small.

There are several variations in adjustment of incisor teeth in this type of malocclusion:

1. In the maxillary and mandibular arches, or in either arch individually, the erupting permanent lateral incisors have caused the exfoliation of the deciduous canines. The incisors usually assume fair alignment in the space intended for the permanent canines as well as the incisors.

2. In the mandibular arch, the erupting lateral incisors are partially blocked out—mainly to the lingual, less frequently to the labial. If the lateral incisors are lingual, they will maintain their position until the deciduous canines are exfoliated, or they may attempt to rotate into the lateral space. In either event, there is usually a noticeable loss of alveolar bone on the labial side of one mandibular central incisor.

This loss of alveolar bone is interpreted in the following manner: The mandibular lateral incisors, in their eruptive tendency to move labially with the help of tongue action, are exerting labial pressure on the mandibular central incisor, which is covered by a thin layer of alveolar bone. The mandibular central incisor is restricted in its labial tendency by the maxillary central incisor, causing traumatization which results in alveolar bone loss.

3. In the maxillary arch, the unerupted lateral incisors are most frequently found in a position lingual to the erupted central incisors. If the maxillary deciduous canine maintains its position, and it usually does, the erupting lateral incisors will be held to the lingual and will lock behind the lower incisors. Occasionally, we find that the maxillary lateral incisor has erupted to the labial; also we may find the maxillary lateral incisor attempting to rotate into the lateral space similar to the mandibular lateral incisor. Whether they will stay in lingual position or attempt to rotate into the lateral space will depend somewhat on the degree of overbite.

PLAN OF TREATMENT

All four deciduous canines are removed after the eruption of the mandibular lateral incisors and before the eruption of the maxillary lateral incisors. This phase of treatment is referred to as the "period of incisor adjustment." Generally speaking, there is an improvement in alignment of the incisor teeth, whether they are labial, lingual, or rotated.

Fig. 2.—Maxillary and mandibular permanent lateral incisors erupt to lingual due to insufficient arch length and retention of deciduous canines. Note loss of the labial alveolar bone of mandibular right central incisor.

Fig. 3.—Incisor adjustment after removal of deciduous canines.

No mechanical appliances are used if the second deciduous molars are present and in good condition.

Foster[1] supports the contention that the buccal teeth do not migrate forward when the deciduous canines are removed in the mandibular arch.

After the period of incisor adjustment, the next procedure in the treatment plan is to decide when is the best time to remove the four first premolars to allow for the most favorable adjustment of the permanent canines (barring an unusual breakdown of the first permanent molars, the congenital absence of second premolars, or their malformation). This phase of treatment is referred to as the "period of canine adjustment." The most favorable time for removal of the first premolars depends on the sequence of eruption of the canines and first premolars; this is determined by x-ray examination approximately one year after the removal of the deciduous canines.

There are three possibilities:

1. If the x-ray examination shows that the canine will erupt before the first premolar, the first deciduous molars and unerupted first premolars should be removed. This sequence of eruption occurs infrequently in the maxillary arch. In the mandibular arch, it occurs in approximately 60 per cent of all cases.[7]

Fig. 4.—Alternate plan used to eliminate enucleation of first premolar. When canine erupts before first premolar, the second deciduous molar is removed, allowing first premolar to erupt; it is then removed.

In order to relieve the surgical procedure involved in the enucleation of the unerupted first premolar, an alternate plan has been used. However, the axial inclination of the canine does not compare favorably with canine adjustment following removal of the unerupted first premolar.

The alternate plan is as follows: When the canine will erupt before the first premolar, instead of the first deciduous molar and first premolar being removed at the same time, the first deciduous molar is removed and approximately six months later the second deciduous molar is removed. This allows the unerupted first premolar to move distally in the alveolar trough as the canine erupts. (The unerupted first premolar has been held in forward position by the mesial root of the second deciduous molar.) The first premolar erupts over the

unerupted second premolar; then the first premolar is removed upon eruption. When the second deciduous molar is removed, it is a wise procedure to place a lingual appliance to prevent the first permanent molar from moving mesially, particularly if the second permanent molar will erupt before the second premolar. This sequence occurs in 25 per cent of all cases. This plan does not allow the best adjustment of the canine and it entails the possibility of preventive appliances, but it does eliminate an unwanted surgical procedure.

2. If the x-ray picture shows that the canine and premolar appear to be even in their eruption rate, the first deciduous molar is removed to allow the eruption of the first premolars before the eruption of the canine. After the eruption of the first premolars, they are removed.

3. If the x-ray picture shows that the first premolars will erupt before the canines, the premolar removal is deferred until its eruption and the first deciduous molar is allowed to exfoliate. During the period of canine adjustment, the exfoliation of the second deciduous molar takes place and the second premolar erupts. After a maximum period of canine eruption and adjustment and eruption of the second premolars, the time has arrived for mechanical treatment. The problem at this time consists of closing any remaining spaces, changing axial inclinations, rotation of individual teeth, and opening the bite if possible and indicated.

The early removal of the deciduous canines is indicated in Class I malocclusions showing insufficient arch length or severe lack of intercanine space, and the advantages and conclusions may be summarized as follows:

1. Further loss of alveolar bone on the labial surface of the mandibular central incisors is prevented.

2. Lingual locking of the maxillary lateral incisors is prevented.

3. Early removal eliminates severe crowding and overlapping of the incisor teeth and should reduce the caries incidence.

Following the removal of the deciduous canines and after the period of incisor adjustment, if the first premolars are not removed as suggested to allow a favorable adjustment of the permanent canines, either the incisor region will become recrowded and irregular or the permanent canines will be completely or partially blocked out.

The advantages of the earlier removal of the first premolars may be summarized as follows:

1. The possibility of a psychologic problem associated with the appearance of unsightly and irregular teeth is reduced, as the patient is carried through a period of dental development without any extreme irregularity.

2. The time for mechanical treatment is reduced considerably, and the retention period is relieved.

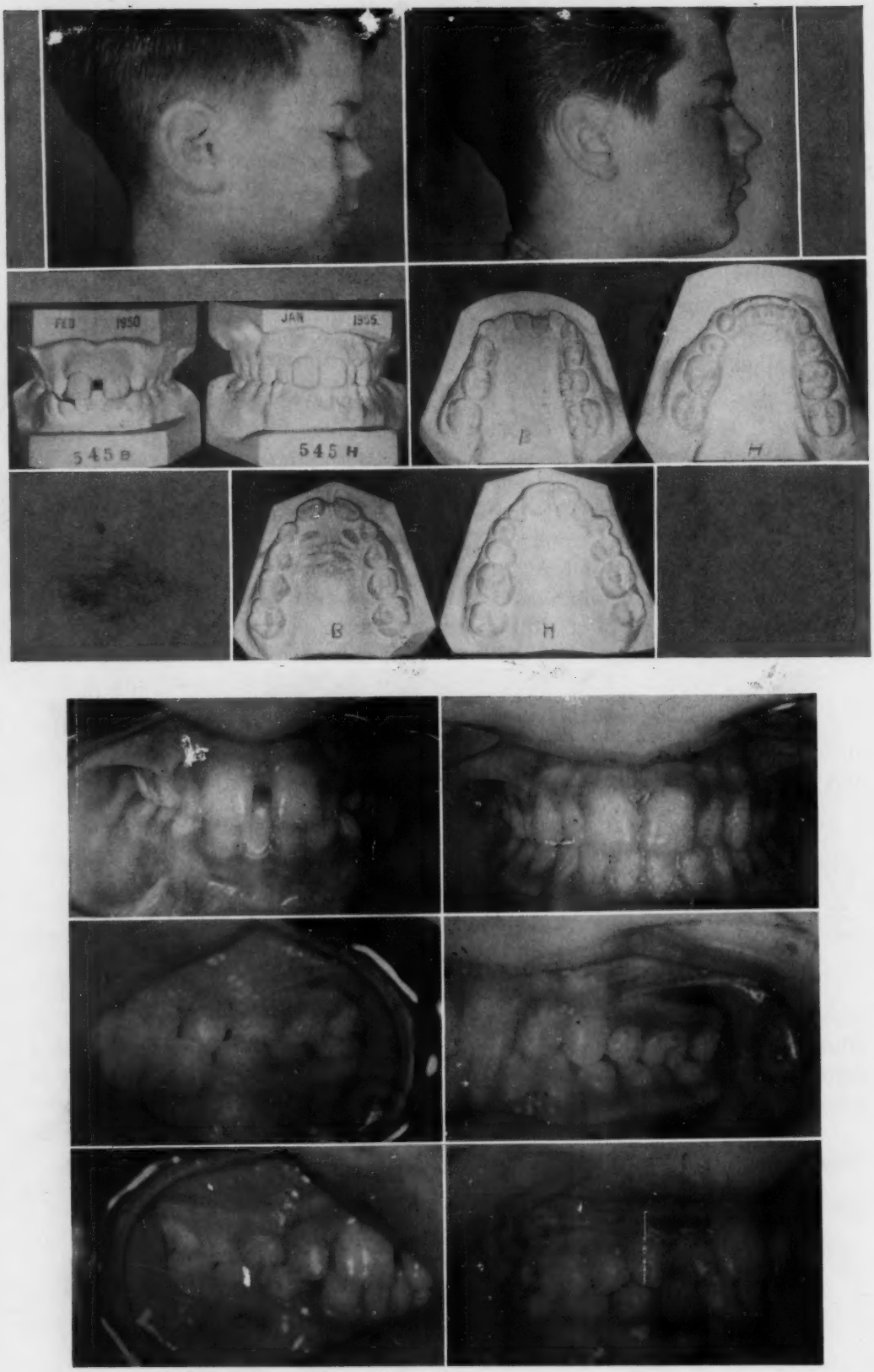

Fig. 5.—Intraoral views, models, and profile photographs of case in which serial extraction procedures were followed over a period of six years. Appliance therapy was used only to position maxillary right lateral incisor; this could have been eliminated by earlier removal of deciduous canines.

3. A displacement of anchorage of the buccal teeth is prevented, as the major canine adjustment takes place without the necessity of mechanical treatment to move the canines distally.

The type of malocclusion just described is a very specific type, and lends itself very favorably to orderly tooth removal. Serial extraction or early removal of teeth can be beneficial in many other types of cases. However, an appraisal of these cases reveals that some mechanical appliances are indicated either to prevent undesirable movement or actually to apply orthodontic force.

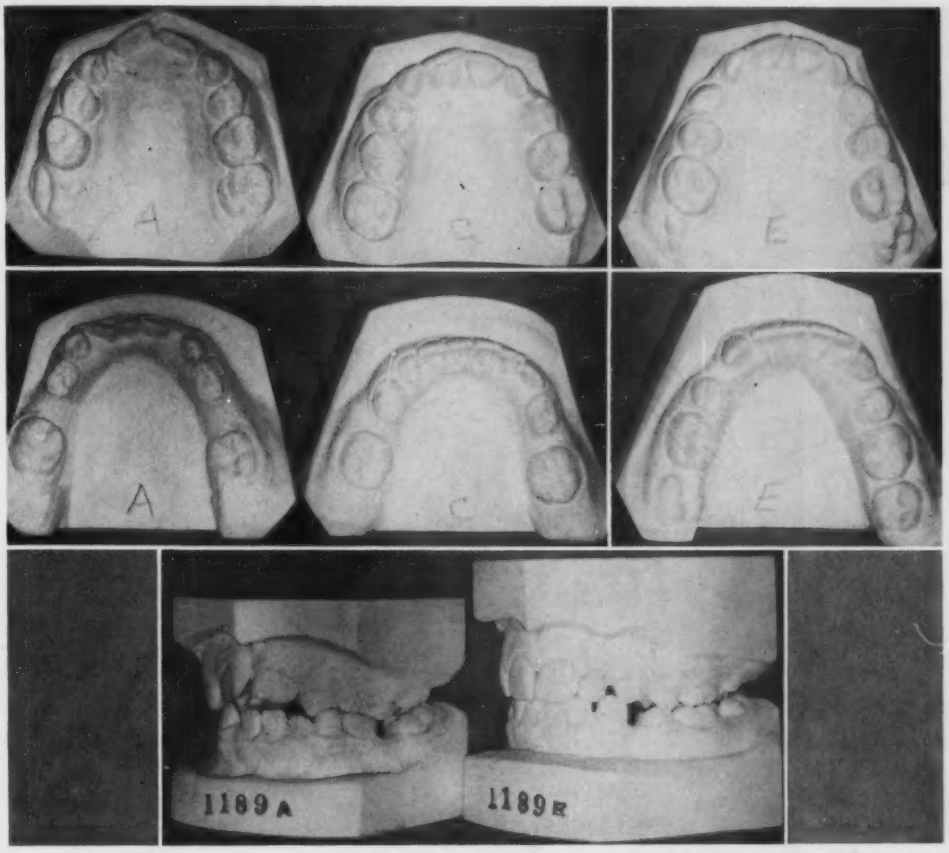

Fig. 6.—Appliance therapy indicated (*E*) after five and one-half years of serial extraction procedures. Note change of posterior cross-bite after removal of deciduous canines.

Class I malocclusions that show mandibular incisor crowding, with protruded maxillary incisors, lend themselves very nicely to early extraction. Mechanical reduction of the maxillary protrusion is necessitated as serial extraction is carried on simultaneously. Malocclusions that have lingually locked maxillary incisors—that is, anterior cross-bite—buccal teeth that are in cross-bite, or those that lack occlusion but show deficient arch length or lack of intercanine space are mechanically treated for a short period until the cross-bite is changed, and the serial extraction procedure is continued.

Bimaxillary protrusions show beneficial results from serial extraction procedure; not too many have been seen in the earlier stages because they do not show the typically deficient arch length and lack of intercanine space. A lip-retracting exercise in these cases is helpful in the uprighting and lingual positioning of the incisors. In the diagnosis of this type of malocclusion, it is suggested that a headplate be used to supplement the diagnosis.

Cases that show a shortening of arch length due to early loss of second deciduous molars, either through caries or the ectopic eruption of the first permanent molars, lend themselves very favorably to serial extraction, even more so if there is some deficiency in intercanine width. The lack of intercanine space and what has been lost in arch length by the forward positioning of the first permanent molars will determine when mechanical treatment should be employed.

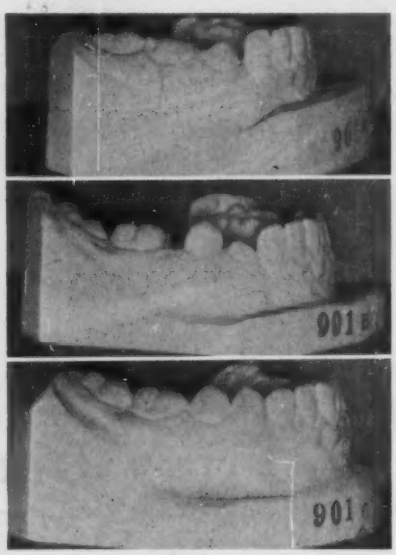

Fig. 7.—Unerupted permanent canine will position first premolar distally, after removal of second deciduous molar, in case having congenital absence of second premolar.

Should further forward movement of the first permanent molars be prevented? Should an attempt be made at this time to position the first permanent molars distally and then hold in position? Or is mechanical treatment necessary at this time?

In malocclusions that show a decided lack of intercanine space and also congenital absence of the second premolars, the following procedure is suggested to gain maximum adjustment:

1. Remove deciduous canines after mandibular permanent lateral incisors have erupted and before eruption of maxillary lateral incisors.

2. Determine by x-ray examination the sequence of eruption of the canine and first premolar.

3. If the first premolar will erupt before the canine, remove the second deciduous molar on eruption of the first premolar. A lingual arch is placed at this time to prevent tipping and forward migration of first permanent molar.

4. If the canine will erupt before the first premolar, the first and second deciduous molars should be removed at the same time to gain the maximum distal movement of the first premolars and canines. A lingual appliance is placed to prevent forward migration of the first permanent molars; after maximum adjustment of the canines and first premolars, the lingual appliance can be removed. Appliance therapy can then be instituted to correct any rotations, close spaces, change axial inclinations and open bite.

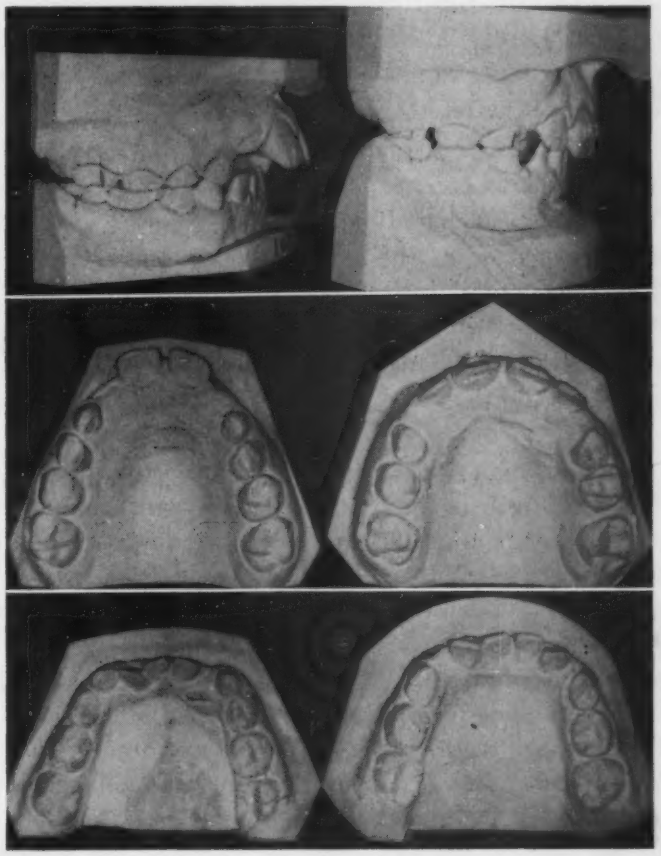

Fig. 8.—Extraoral force used to change molar position and reduce protrusion in Class II, Division 1 malocclusion while serial extraction procedures are employed simultaneously.

Another type of malocclusion where serial extraction can be helpful is that in which the mandibular arch has sufficient arch length with the incisors in excellent alignment, but in which the maxillary arch shows a decided lack of space for the erupting lateral incisors due to forward eruption of the buccal teeth, rather than to lack of intercanine space. Early removal of the maxillary

deciduous canines will prevent the lingual locking of the maxillary permanent lateral incisors. The first premolars are removed on eruption unless the canine will erupt before the premolar, in which case the premolars should be removed before eruption or the suggested alternate plan should be used. Mechanical treatment may not be required in this type of malocclusion.

In Class II, Division 1 malocclusions that show a definite shortening of arch length or lack of intercanine space in the mandibular arch, serial extraction procedure has been followed. Extraoral force has been used in the maxillary arch for incisor retraction and molar adjustment. During and after molar adjustment and incisor retraction, serial extraction is carried on at the same time. Removable retentive appliances are used after the first period of mechanical treatment; there will be a second period of mechanical therapy after extraction procedures are completed and all permanent teeth are erupted. (*Note:* In the retraction of maxillary incisors in severe Class II, Division 1 cases one must be careful not to retract to a point where the unerupted maxillary canine will be labial to the lateral incisor root.)

In describing the serial extraction procedure, the first suggested removal has been of the deciduous canine. Occasionally it may be necessary, on the eruption of the permanent mandibular central incisors, if lack of space is causing an unusual rotation of the mandibular central incisors, to remove the mandibular deciduous lateral incisor and then follow the serial extraction of the other teeth that has been described previously.

Remember that the malocclusions that have been described show, or will show, decided lack of arch length or intercanine space in both the maxillae and the mandible.

If these malocclusions are divided into three groups—severe, medium, and slight lack of arch length or intercanine space—our treatment procedure is clear in the severe and medium crowding; as we approach the mild or slight crowding, we find it difficult to make an early decision, as our space-closing problem becomes more difficult the further we are away from the severely crowded malocclusion.

With any treatment procedure, I am sure that there are some disadvantages. The only one that has come to my attention in serial extraction is some lingual inclination of the incisor teeth, particularly the mandibular incisors, when the deciduous canines are removed. With this lingual inclination there possibly will be elongation of the incisors, increasing the incisal overbite. The greater the overjet at the time of deciduous canine removal, the greater will be the lingual inclination of the mandibular incisor teeth. In this treatment procedure, the use of a lingual appliance, or even the use of a bite plate, may mimimize this lingual inclination. However, I am not sure that this possible increase in incisal overbite has any long-term disadvantage. Will the severely crowded cases that were allowed to develop to their maximum deformity with the eruption of all teeth show less incisal overbite? An attempt has been made to overcome this possible disadvantage—that is, the increase in incisal overbite—by altering

the extraction procedure in the mandible and removing the first deciduous molar instead of the deciduous canine as the first step in the treatment plan. At this time, there are no conclusions to report.

The experience gained in practicing this procedure has been invaluable and rewarding. It is good to know that the final result of this treatment plan, which has required considerable patience, thought, and observation, will embody the results we like to see in the treatment of our patients.

REFERENCES

1. Foster, H. R.: An Analysis of the Developing Dentition, J. Am. Dent. A. **42**: 376-387, 1951.
2. Kelly, Eugene J.: Treatment in the Mixed Dentition, Angle Orthodontist **20**: 102-108, 1950.
3. Kjellgren, Birger: Serial Extraction as a Corrective Procedure in Dental Orthopedic Therapy, Acta odont. scandinav. **8**: January, 1948.
4. Heath, John: Planned Serial Extraction Methods Designed to Intercept Malocclusion of the Human Teeth: A Planned Minimum of Mechanical Orthodontics, Unpublished Articles Mailed to the Author as Professor of Orthodontics, Georgetown University, Washington, D. C.
5. Lloyd, Z. Bernard: A Composite Case Report of Class I Malocclusions With Insufficient Arch Length, AM. J. ORTHODONTICS **39**: 262-267, 1953.
6. Dewel, B. F.: Serial Extraction in Orthodontics: Indications, Objectives, and Treatment Procedures, AM. J. ORTHODONTICS **40**: 906-926, 1954.
7. Lo, Robert: A Study of the Normal Sequence of Eruption of the Permanent Dentition, Contribution From Orthodontic Department, University of Toronto, Read at Research Committee Program at American Association Orthodontists' Meeting, May, 1950, in Chicago, Illinois.

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THE DIAGNOSTIC SETUP WITH CONSIDERATION OF THE THIRD DIMENSION

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PLASTER casts have long been in use for the analysis and treatment planning of all orthodontic cases. Although they have been considered study casts, much of the study has been merely speculation as to what might be accomplished orthodontically. Diagnosis through rearrangement of the plaster teeth was overlooked. Good orthodontic casts not only provide exact duplicates of every tooth in the mouth, but they also give a fairly accurate pattern of the apical base. Since neither apical base nor tooth size can be altered materially, intelligent rearrangement of the plaster teeth on the model can replace the confusion of speculation with concrete objective manipulation. An orthodontist armed with such vital information of these basic factors of any orthodontic case can certainly approach the problems of treatment with more confidence. Without dissecting the teeth from the orthodontic models and rearranging them in the most desirable positions on the available apical bases, the orthodontist can only speculate as to the possibilities and limitations of treatment.

About ten years ago, while developing the tooth positioner, we found it necessary to make many such setups, dissecting the teeth from plaster models and rearranging them in wax in more desirable relationships. The experience of constructing these setups for cases just completing basic treatment leads us to believe that much benefit could be derived from the preparation of similar setups constructed from the original models prior to undertaking treatment. The idea of such a diagnostic setup was shelved for a few years, as all available time was devoted to perfecting the tooth positioner, and it was not until 1946 that we made our first attempt to teach the technique to a class.

Since 1940, I have followed the Tweed philosophy of treatment. Therefore, from the beginning of the experiments, an effort was made to position the teeth in accordance with this philosophy. In the earliest diagnostic setups, the angulation of the teeth was only estimated. The mandibular anterior teeth were patient. Following Tweed's[1] presentation of his ideas with regard to the Frankfort-mandibular plane angle, published in the AMERICAN JOURNAL OF ORTHODONTICS AND ORAL SURGERY, we revised our technique to conform to these refinements. The formula developed at that time was not scientific, but it proved to be practical clinically. Referring to Fig. 1, the long axis of the mandibular incisor was set at 90 degrees to the mandibular plane in those cases having a 25 degree Frankfort-mandibular plane angle (FMPA). As the FMPA in-

*Presented before the Charles H. Tweed Foundation for Orthodontic Research, Drake Hotel, Chicago, Illinois, Oct. 31, 1953.

creased by 1 degree, the incisor was set 1 degree to the lingual, or 89 degrees to the mandibular plane. This ratio was maintained until the angle reached about 33 degrees, at which point the incisor would be placed at –8 degrees, or 82 degrees to the mandibular plane. As the FMPA exceeded 33 degrees, the –8 degrees was maintained, because it was our conviction that –8 degrees was the maximum lingual position possible for an incisor. Similar limitations were observed in the labial positioning, using +5 as the maximum labial position, regardless of how favorable the FMPA might be.

FMPA 20° = +5 IMA
FMPA 21° = 4 IMA
FMPA 22° = 3 IMA
FMPA 23° = 2 IMA
FMPA 24° = 1 IMA
FMPA 25° = 0 IMA
FMPA 26° = -1 IMA
FMPA 27° = -2 IMA
FMPA 28° = -3 IMA
FMPA 29° = -4 IMA
FMPA 30° = -5 IMA
FMPA 31° = -6 IMA
FMPA 32° = -7 IMA
FMPA 33° = -8 IMA

Fig. 1.—Formula for positioning lower anterior teeth.

When Tweed[2] demonstrated the use of the lateral head x-ray to determine the angulation of teeth, the diagnostic setup became much more accurate. A tracing made from a lateral head x-ray of any orthodontic case would show definitely the relationship of the mandibular incisor to the mandibular plane. Thus, we can eliminate the guesswork from the positioning of this tooth. Since we begin the diagnostic setup in all cases with the positioning of the lower incisor, it is very important to know the angulation of this tooth in the malocclusion. Using the formula developed in the past, the desired position can also be drawn on the tracing (Fig. 4). By a comparison of these two lines on the tracing, it is possible to determine the exact measurement, in millimeters, that the incisal edge must be changed. In altering the angulation of the incisor, care must be taken to maintain the apical root end in the apical base. As treatment progresses, similar x-ray films can show the new angulations of the incisors. Cases have been reported where these teeth have been moved as much as 25 degrees. For this reason, our formula was expanded to allow for considerably more latitude in lingual positioning.

For the benefit of those readers who may be unfamiliar with the technique of constructing a setup, let us consider those things which are necessary for its preparation. Plaster casts of the malocclusion (Fig. 2), instruments (Fig. 3), intraoral x-ray films, a photograph of the patient, and a tracing of a lateral head x-ray (Fig. 4) are included. On the tracing of the lateral head x-ray shown, the Frankfort plane is indicated by line *A-B*, the mandibular plane by *A-C*, the long axis of the mandibular incisor by *C-B*, and the apex by *D*. The desired position of the long axis of the incisor is *D-E*. In this particular case, the FMPA is 27 degrees, the incisor-mandibular plane angle (IMPA) is 102 de-

Fig. 2.—Plaster casts of malocclusion.

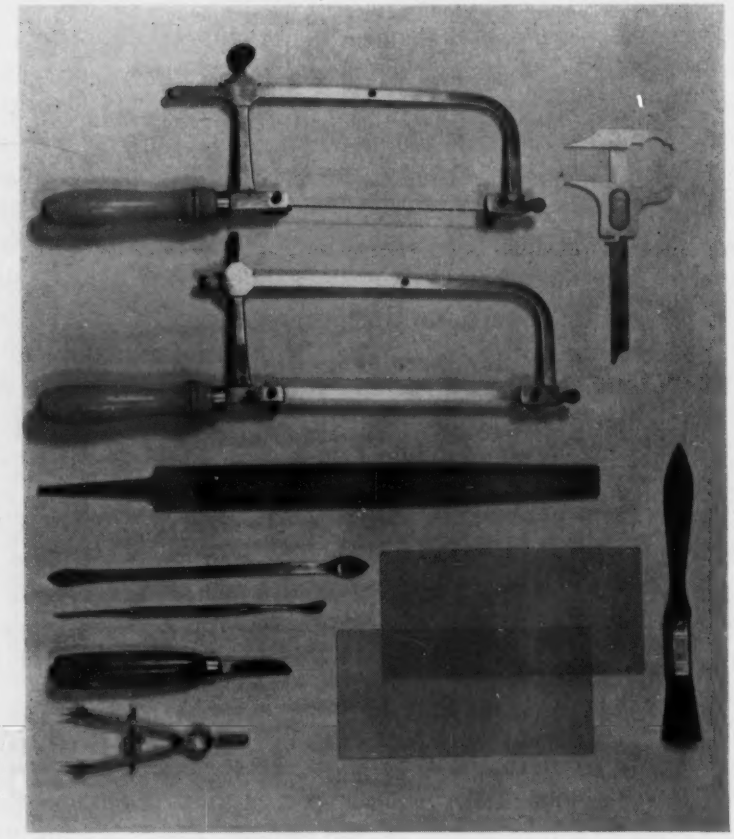

Fig. 3.—Instruments required for the execution of the diagnostic setup.

grees, and the Frankfort-mandibular incisor angle (FMIA) is 51 degrees. With a 27 degree FMPA, our formula indicates that this tooth should be positioned at –2 degrees, or 88 degrees. This is 14 degrees different from the 102 degrees shown on the tracing. Therefore, the dotted line, *D-E,* is drawn from the apex of the mandibular incisor to the Frankfort plane, 14 degrees lingual to *C-B,* the original position of the tooth. With calipers, or a millimeter gauge, the distance from the tip of the incisor to the dotted line can be measured. This is the distance that the tooth must be tipped to the lingual on the setup.

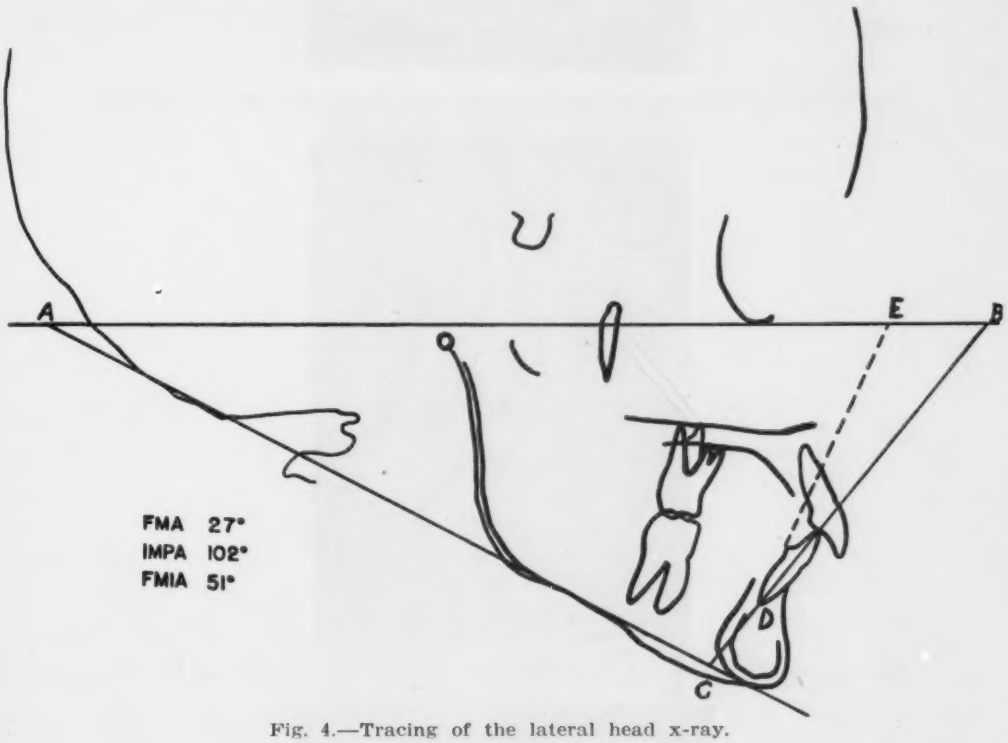

Fig. 4.—Tracing of the lateral head x-ray.

Now we are ready to begin the actual construction. First, we propose to dissect and remove the teeth on the left side of the mandibular model, leaving only the most distal tooth. With a spiral plaster saw blade, a horizontal cut is made deep into the base of the model. Using a ribbon saw blade, vertical cuts are made between the incisors down to the original horizontal cut, allowing two incisors to be removed (Fig. 5). It is very important that a sufficient amount of the root portion be removed to resemble the normal length of the root. The incisors on the opposite side are retained on the model, for the time being, to serve as a guide for repositioning the teeth previously removed. A second horizontal cut is made with the spiral saw blade about 3 mm. rootwise from their gingiva under the remaining teeth to be removed on the left side. The models should be trimmed as shown in Fig. 6. The teeth should be carved as shown in Fig. 7. Note that the teeth are not trimmed on the buccal or lingual surfaces.

In preparation for positioning the teeth, we flow beeswax into the groove carved on the apical base. Then a small amount of beeswax is attached to the apical end of the central and lateral incisors, and they are positioned on the

Fig. 5.—Mandibular model showing horizontal and anterior vertical saw cuts.

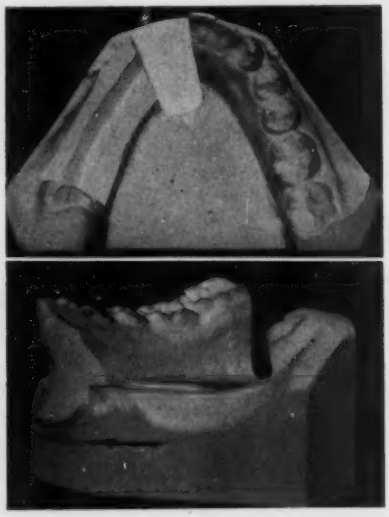

Fig. 6.—Mandibular model, trimmed, after removal of the teeth on left side.

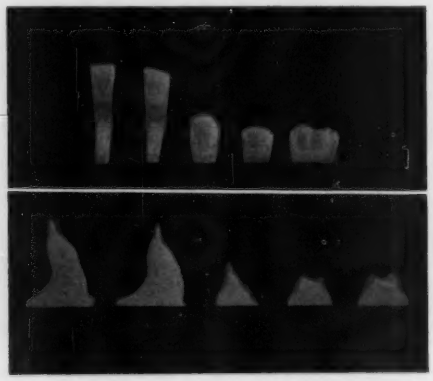

Fig. 7.—Labial, buccal, and mesial views of teeth trimmed for diagnostic setup.

cast. In carrying out this step of the procedure, it is essential that the apices of the teeth should not be shifted to the labial or lingual, while the incisal edges must be moved exactly the distance determined on the tracing, in this

case 6.8 mm. This goal can best be accomplished by keeping the labial art portion of these teeth in the same plane as that of the remaining art portion of the model and, with the calipers, measuring from the labial side of the right central incisor to the labial side of the left central incisor and making this space 6.8 mm. When the central and lateral incisors are repositioned, and are in proper axial inclination, we seal them onto the cast with red setup wax. Then we position the canine in proper relationship with the lateral incisor and the apical base, securing it with a small amount of beeswax. Similarly, we position the remaining dissected teeth. In studying the x-ray pictures and models of the case at hand, if it is evident that the distal molar is tipped forward because of

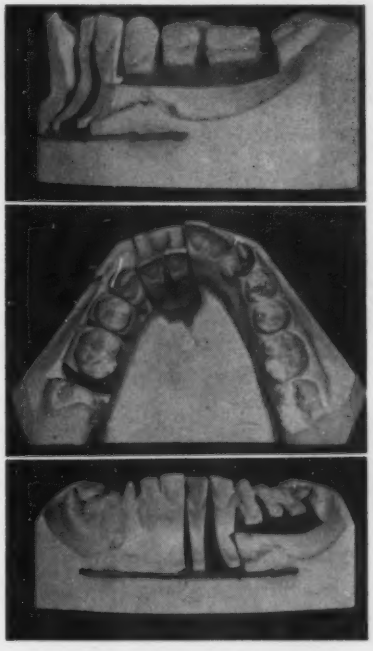

Fig. 8.—Views of mandibular model with teeth on left side repositioned.

lack of mesial support, it is possible to gain space by tipping the tooth into normal axial inclination. If space is still lacking after taking advantage of this possibility, it will be necessary to remove dental units. In such a case, ordinarily the first premolars are eliminated, after which the second premolar is moved up into contact with the canine. Under no circumstances should arch length be gained by increasing the third dimension, or arch width, greater than the apical base can accommodate. The amount of unused space after the teeth are positioned, if any, is a very important guide in treatment planning. The anchorage problem increases as this space decreases. (Fig. 8)

The teeth on the opposite side are now dissected 3 mm. below the gingival margin, including the incisors, and the root portions are trimmed as before.

The teeth are positioned the same as those on the left side, eliminating the same dental units, if necessary (Fig. 9).

The procedure with the maxillary model is undertaken with a spiral saw cut horizontally (Fig. 10). Vertical saw cuts are made with a ribbon saw blade through the interproximal teeth. The teeth are removed and trimmed on the mesial and distal root surfaces before being replaced on the cast in soft beeswax.

Fig. 9.—Occlusal view of mandibular model with first premolars eliminated and teeth positioned.

Fig. 10.—Maxillary model showing horizontal saw cut.

As they are positioned, they should be articulated to the mandibular teeth. At this time, the orthodontist has an opportunity to position the teeth in the very best occlusion, including inclined plane relationship. Tooth discrepancies may be discovered and given early consideration in treatment planning.

In cases where the second molars are fully erupted, they should be removed from the casts and placed in contact with the first molars and in good occlusion. If they are not fully erupted, impressilons of these teeth can be made in the mouth at the end of basic treatment and plaster models of these teeth made which can be added to the setup at that time. Having the second molars in place is essential, particularly if the setup is to be used as a pattern over which a positioner is to be fabricated for the final detailed tooth positioning.

The final waxing of the setup is completed, using pink setup wax for this part of the technique. With a hot spatula, we flow pink wax between the root portions of the teeth, slightly overfilling all the voids on the buccal, labial, and lingual areas of the model. After the wax has hardened, it should be carved to reproduce exactly the gingival areas around the teeth (Fig. 11). If this is successfully accomplished, there will be no irritation from wearing a positioner.

A carefully executed setup, following the above technique, will aid any operator tremendously in making decisions with regard to the advisability of eliminating dental units. As the plaster teeth are placed on the plaster apical base, we have concrete evidence as to whether or not there is sufficient basal bone to accommodate all the teeth in proper position. There is no system of measurement of teeth that will reveal so true and complete a picture. Unusual benefit

Fig. 11.—Front and lateral views of completed setup.

Fig. 12.—Tooth positioner.

is to be derived from the fact that in this way all three dimensions of the denture may be studied. The setup will disclose tooth discrepancies, as well as give advance notice of anchorage problems and it provides a pattern over which to fabricate ideal arch wires during treatment. With such a complete setup, a positioner can be prepared in advance so that it can be placed on the day conventional appliances are removed (Fig. 12). Great advantage is gained by placing a positioner immediately. Finally, the diagnostic setup is particularly valuable in teaching "youngsters" who are unfamiliar with the Tweed philosophy of treatment and, if intelligently executed, some of the "oldsters" might be amazed by the benefits to be derived.

REFERENCES

1. Tweed, C. H.: Frankfort-Mandibular Plane Angle in Orthodontic Diagnosis, Classification, Treatment Planning and Prognosis, AM. J. ORTHODONTICS AND ORAL SURG. **32**: 175-230, 1946.
2. Tweed, C. H.: Evolutionary Trends in Orthodontics, Past, Present and Future, AM. J. ORTHODONTICS **39**: 81, 1953.

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EVALUATION OF THE DENTAL PROBLEMS IN THE CLEFT PALATE PATIENT

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INTRODUCTION

DURING the past decade, considerable controversy has arisen concerning the proper treatment and management of children with cleft palate.[1-3] Most surgeons and speech therapists prefer to repair a cleft palate during the first two years of life in order to enhance the child's chances for good speech. Some, however, now advocate delaying surgery until the child is from 4 to 7 years of age. The procedure for closure of the cleft varies considerably among surgeons. Timing, methods, and techniques of speech therapy are not uniform. Many orthodontists and prosthodontists strongly favor delaying surgery. Therefore, in order to select the "best methods of treatment," it is essential for all active rehabilitation teams to examine their results periodically.

The object of the present study is to evaluate the dental and occlusal results in a group of children whose cleft palates were repaired at the Children's Medical Center in Boston during the past ten years. The policy at this Center has been that of early surgery; for example, within the first two years of life. For proper evaluation of the investigations which led some workers to a policy of delayed closure, it is necessary to examine carefully the results of these early surgical repairs. This study will show that the results have been good enough to warrant the continuation of the present policy.

Conclusive answers to all questions cannot be found in the following presentation; they have not been found in any single approach to the problem. A precise definition of what constitutes the potentialities and limitations of optimum treatment for the cleft palate patient should be the next logical step. This important contribution cannot be made by any one group, but must be an objective synthesis of ideas from all who have contributed to the common problem.

MATERIAL AND METHODS

During the past ten years 1,034 palatoplasties have been performed by the Plastic Surgical Service of the Children's Medical Center in Boston. A majority of these operations were performed before the patient was 2 years of age, prior to

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the establishment of a speech pattern. All were primary one-stage closures of the palate performed by one surgeon who developed and standardized the technical procedures well before the period included in this study.

Two groups of children, totaling 164, were chosen for evaluation. The first group was composed of 108 patients operated on between 1942 and 1952. These were selected, from a much larger number of children with good speech, because they lived within a 300 mile radius of Boston and could be brought back for the study. The second group was drawn from a consecutive series of seventy-five patients operated on in 1946 and 1947; of these, fifty-six were located and were available for study. To avoid cumbersome verbiage, the first group will be called the "selected series" and the second group will be called the "consecutive series." The objectives of the speech evaluation were (1) to determine why the children with good speech have it and (2) to learn what proportion developed good speech after repair.

Dental evaluation was made of the entire group. However, only those children whose cephalometric roentgenograms measured up to the rigid standards of technical quality were included. Therefore, only 111 of the 164 children had data that could be reported. Of these 111 children, eighty-three were in the "selected series" and twenty-eight were in the "consecutive series."

Dental examination included mirror and explorer examination for decayed, missing, and filled teeth. Impressions were taken routinely until a definite pattern of evaluation was established, after which casts were made only on those patients whose occlusions could not be recorded accurately at the chair. An occlusal x-ray picture was taken of every maxilla, and intraoral films were obtained at alveolar sites of clefts as well as all areas of the mouth where teeth were missing. Cephalometric roentgenograms were taken, using a Margolis cephalostat. The findings reported in this article were computed from the study of the lateral cephalograms taken with the teeth in occlusion.

In addition, the following data were obtained on each patient:

1. Age
2. Sex
3. Family history
4. Type of defect
5. Age at time of lip repair
6. Age at time of palate repair
7. Preoperative adequacy of tissue, width of cleft, presence or absence of micrognathia, etc.
8. Time of onset of speech; a description of preoperative speech
9. Analysis of speech, including a tape recording made for each child
10. Type of speech training (if any)
11. Velar length and activity
12. Presence of Passavant's ridge and/or lateral pharyngeal activity
13. Audiometric evaluation

14. Ear, nose, and throat status, including T and A and any post-operative nasality
15. Orthodontic intervention; time and amount of treatment
16. Estimation of child's intelligence and general adjustment
17. Estimation of adequacy of home environment.

The details of the medical, surgical, and speech aspects listed above have already been reported.[4] This article will deal primarily with the dental aspects. In addition to the cephalometric study of the cleft palate patients, similar cephalometric examinations were carried out on twenty-five children who had no history of palatal defects. This was necessary, since it must be assumed that the majority of the factors which produce malocclusions in the general population also influence the growth and development of the patient with a cleft palate anomaly. This group included a cross section with a broad socio-economic representation, so that comparison of data on cleft palate patients with this group of "average-normals" can be considered more helpful than comparison of similar data with "ideal-normals."

RESULTS

Since a total of thirty-two observations was recorded for each patient, the proper interpretation of the data becomes very difficult. It is impossible to interrelate all of the variables, giving each its proper significance; yet generalizations drawn from one or a few measurements are likely to be misleading and result in conclusions which are an oversimplification of the problem.

The patients were classified according to the type of original defect. Those patients who had clefts of the soft palate and the hard palate up to, but not including, the alveolar ridge made up Group I. This would correspond to types I and II of Veau's classification.[5] Seven patients with soft palate defects only were included. These did not differ from Veau's type II and formed a group too small to be considered separately. In Group I there was a total of fifty patients, including twelve of the "consecutive series."

Group II consisted of patients with left alveolar defects in addition to hard and soft palate clefts. Of the 111 patients studied, thirty-four were of this type, six of these being from the "consecutive series."

Group III was similar to Group II, but included the right rather than left alveolar defects. This differentiation was made in order to determine if any significant differences exist between them. Group III consists of seventeen patients, five of whom were of the "consecutive series."

Ten patients with bilateral alveolar clefts made up Group IV; five of these were of the "consecutive series."

Age.—The mean ages of the patients were 8.2, 7.6, 8.5, and 8.6 years in Groups I through IV, respectively. The mean age for the entire series was 8.1 years, while that of the twenty-five children serving as controls was 8.9 years.

Sex.—Sixty-six boys and forty-five girls were included in this study.

The Downs analysis[6] was used for interpretation of the cephalometric roentgenograms. This method is now in common usage and lends itself well to a study

of this type, wherein an over-all evaluation of skeletal pattern is made from the lateral cephalograms. Where bilateral structures produced two distinct outlines, the mid-point between these outlines was used as point of reference. Landmarks were determined and emphasized in pencil directly on the films. Angular measurements were then made, using Baum's[7] technique.

The Facial Angle (Table I).—This angle is used to relate the profile chin point in an anteroposterior direction to other cranial landmarks. In the Downs analysis, it represents the inside inferior angle formed by the intersection of the Frankfort horizontal plane with the facial plane (nasion-pogonion). In Table I a statistical comparison is made among the four groups of cleft palate patients. Also included are the values for Downs' "ideal-normal" as well as the figures derived from the unselected group of twenty-five "average-normal" controls.

TABLE I. THE FACIAL ANGLE

PATIENT CLASSIFICATION	NUMBER OF CASES	RANGE		MEAN	S.D.	S.D. MEAN
		MAXIMUM	MINIMUM			
Downs' ideal-normals	20	95	81	88.00	3.57	0.79
Non-cleft palate children	25	91	73	81.40	5.17	1.03
Cleft palate children						
Group I total	50	91	70	80.36	4.26	0.60
Selected	38	91	70	80.57	4.79	0.78
Consecutive	12	86	71	79.75	3.90	1.12
Group II total	34	90	68	80.35	3.93	0.67
Selected	28	90	68	80.64	4.14	0.83
Consecutive	6	83	76	79.00	2.51	1.02
Group III total	17	84	77	80.88	2.10	0.50
Selected	12	84	77	80.41	2.29	0.66
Consecutive	5	83	79	82.00	1.54	0.68
Groups II and III total	51	90	68	80.52	3.43	0.48
Group IV total	10	92	66	80.10	6.28	1.98
Selected	5	92	77	84.40	7.35	3.28
Consecutive	5	80	66	75.80	5.00	2.24

The means for the facial angle of the 111 cases studied were approximately 80 degrees, 7 degrees less than the mean of Downs' "ideal-normals." This value falls just below the minimum value found in his group of twenty cases. However, a facial angle of 81 degrees for our control group of twenty-five children minimizes the significance of this angular difference per se. This can be interpreted only to indicate that in the present series the chin point was not prognathic when related to the Frankfort horizontal plane.

The Y Axis (Table II).—As an index of the growth pattern, the Y axis is used to denote the path of downward and forward growth of the face. In normal growth this axis, being a line from the center of sella turcica to gnathion, bears a relatively constant relationship to the Frankfort plane. Thus, its significance is greater in a longitudinal study where individual patterns can be followed.

TABLE II. THE Y AXIS

PATIENT CLASSIFICATION	NUMBER OF CASES	RANGE		MEAN	S.D.	S.D. MEAN
		MAXIMUM	MINIMUM			
Downs' ideal-normals	20	67	62	59.00	3.82	0.85
Non-cleft palate children	25	74	54	64.00	5.10	1.02
Cleft palate children						
Group I total	50	77	56	65.10	3.70	0.52
Selected	38	77	56	64.94	3.65	0.59
Consecutive	12	74	60	65.66	3.85	1.11
Group II total	34	75	57	65.24	3.92	0.67
Selected	28	75	57	64.82	4.02	0.75
Consecutive	6	74	60	67.16	3.39	1.38
Group III total	17	70	62	64.05	1.97	0.47
Selected	12	70	62	64.33	2.28	0.66
Consecutive	5	64	63	63.40	0.63	0.28
Groups II and III total	51	75	57	64.84	3.39	0.47
Group IV total	10	75	53	64.70	6.68	2.11
Selected	5	70		60.40	5.79	2.58
Consecutive	5	75	64	69.00	6.23	2.78

The Y axis was found to form a mean angle of about 65 degrees with the Frankfort plane in all types of cleft palate patients. This is a mean 1 degree larger than that of the control group of "average-normals" and 6 degrees greater than that of the standard for "ideal-normals." There was a maximum value of 77 degrees and a minimum angle of 53 degrees, showing a wide range in the patients studied. An increase in the values representing the Y axis is not surprising in view of the decrease in the facial angle noted above.

The Mandibular Plane Angle (Table III).—The importance of the angular relationship of the lower border of the mandible to the denture and the cranium

TABLE III. THE MANDIBULAR PLANE ANGLE

PATIENT CLASSIFICATION	NUMBER OF CASES	RANGE		MEAN	S.D.	S.D. MEAN
		MAXIMUM	MINIMUM			
Downs' ideal-normals	20	29	16	23.00	3.24	0.72
Non-cleft palate children	25	38	20	29.80	5.55	1.11
Cleft palate children						
Group I total	50	43	19	32.92	6.01	0.85
Selected	38	43	19	32.42	6.49	1.05
Consecutive	12	42	28	34.50	4.16	1.20
Group II total	34	41	26	32.88	4.79	0.82
Selected	28	41	23	32.42	4.84	0.91
Consecutive	6	39	26	34.33	4.35	1.77
Group III total	17	45	23	32.82	5.29	1.28
Selected	12	45	24	34.08	5.45	1.57
Consecutive	5	36	23	29.80	4.17	1.86
Groups II and III total	51	45	23	32.86	5.04	0.71
Group IV total	10	48	25	34.60	7.17	2.26
Selected	5	40	25	30.40	6.41	2.86
Consecutive	5	48	33	38.80	5.51	2.46

has been emphasized repeatedly.[8-10] This angle is formed by the intersection of the Frankfort horizontal plane and a tangent to the lower border of the mandible.

The mean values for Group I through Group IV were all considerably larger than the Downs standard. The difference was in the vicinity of 10 degrees. When compared with the "average-normal" controls, however, the values were not strikingly dissimilar, the means being only 2 or 3 degrees larger.

The Angle of Convexity(Table IV).—This is a measure of the relationship of the maxilla to the facial plane. The angle is formed by the intersection of two lines: nasion to A, and pogonion to A, where A is subspinale, the deepest midline point of the prexamilla. Positive values denote convexity, and negative values are found in the concave profile.

TABLE IV. ANGLE OF CONVEXITY

PATIENT CLASSIFICATION	NUMBER OF CASES	RANGE		MEAN	S.D.	S.D. MEAN
		MAXIMUM	MINIMUM			
Downs' ideal-normals	20	10	-10	0.00	5.09	1.14
Non-cleft palate children	25	17	- 3	8.20	5.43	1.00
Cleft palate children						
Group I total	50	17	-12	4.70	5.95	0.84
Selected	38	17	-12	5.05	5.63	1.62
Consecutive	12	12	- 5	3.58	5.63	1.62
Group II total	34	24	- 4	8.02	6.52	1.12
Selected	28	24	- 4	8.25	6.80	1.29
Consecutive	6	11	- 4	7.00	5.38	2.19
Group III total	17	18	- 6	8.82	6.34	1.54
Selected	12	18	- 6	8.00	6.36	1.84
Consecutive	5	18	4	10.80	5.84	2.61
Groups II and III total	51	24	- 6	8.29	6.44	0.90
Group IV total	7	25	-11	12.43	11.40	4.31
Selected	4	25	12	18.66	11.16	6.44
Consecutive	3	19	-11	7.75	12.43	6.21

The mean for ideal-normals was found by Downs to be 0 degrees. This places point A on the facial plane. The standard deviation for the angle of convexity points out the variability of this measurement in all categories, including the ideal-normals.

The cleft palate children also were found to have angles of which the means all denoted *varying degrees of convexity.* The unusually high values recorded for patients with bilateral alveolar clefts cannot be considered of real significance in view of the very small samples. Also, in this type of defect a semifree premaxilla may be displaced forward, wherein it does not serve as a true index of the forward extent of the firm maxillary components which may later have to serve as anchorage for prostheses.

The somewhat larger values seen in Groups II and III patients may be misleading. In some cases, incisors were located very high near the base of the nose, altering the profile of the maxilla. Thus, instead of a smooth, concave curva-

ture to the anterior midline view, the anterior border of the maxilla appeared straight and occasionally presented a bulge of the alveolar bone overlying incisors located unusually high.

The Angle of AB Plane to Facial Plane (Table V).—Used to depict the anterior limits of the denture bases to each other and to the profile, this angle is formed by the intersection of the facial plane with the plane AB. Point B is here supramentale, the deepest midline point on the mandible.

TABLE V. ANGLE OF AB PLANE TO FACIAL PLANE

PATIENT CLASSIFICATION	NUMBER OF CASES	RANGE		MEAN	S.D.	S.D. MEAN
		MAXIMUM	MINIMUM			
Downs' ideal-normals	20	1	-10	-5.00	3.67	0.82
Non-cleft palate children	25	0	-14	-7.20	3.32	0.66
Cleft palate children						
Group I total	50	5	-11	-4.34	4.02	0.57
Selected	38	4	-11	-4.97	3.77	0.61
Consecutive	12	5	- 9	-2.33	4.18	1.21
Group II total	34	1	-13	-5.85	3.79	0.65
Selected	28	1	-13	-6.14	3.70	0.70
Consecutive	6	1	- 9	-4.50	3.97	1.62
Group III total	17	5	-15	-6.88	4.61	1.12
Selected	12	-1	-11	-6.91	3.30	0.95
Consecutive	5	5	-15	-6.80	6.78	3.03
Groups II and III total	51	5	-15	-6.19	3.84	0.54
Group IV total	7	11	-14	-6.43	9.26	3.49
Selected	3	-6	-14	-11.00	3.56	2.06
Consecutive	4	11	-14	-3.25	12.29	7.09

Mean values were very similar in all categories. This indicates that plane AB bore the same relationship to the facial plane in these cleft palate patients as was noted by Downs in his study of harmonious faces with ideal occlusions. Since point A was prominent (angle of convexity being positive), point B would also have to be relatively procumbent in order to produce this parallel of planes. A possible explanation for this may be that the samples were of young children with less prominence of pogonion than would be noted in an older age group.

The remaining angles to be considered in the Downs analysis pertain to measurements of the teeth and alveolar processes. The range of individual variation here was found to be greater than in the angles related to the skeletal pattern. A similarity in the means for the four classifications of cleft palate anomaly was again noted.

The Cant of the Occlusal Plane (Table VI).—This is the angular relationship between the Frankfort horizontal plane and the occlusal plane. The latter is a straight line determined by bisecting the first molar cusps and the overbite of the central incisors.

The mean angles formed by the intersection of the Frankfort and occlusal planes were greater than the 9 degree mean of Downs. This is not surprising

TABLE VI. CANT OF OCCLUSAL PLANE

PATIENT CLASSIFICATION	NUMBER OF CASES	RANGE		MEAN	S.D.	S.D. MEAN
		MAXIMUM	MINIMUM			
Downs' ideal-normals	20	17	2	9.00	3.83	0.86
Non-cleft palate children	25	24	1	13.70	5.24	1.05
Cleft palate children						
Group I total	50	27	5	14.78	4.83	0.68
Selected	38	27	5	14.34	4.91	0.80
Consecutive	12	25	11	16.16	4.09	1.18
Group II total	34	27	4	14.85	5.12	0.88
Selected	28	27	4	14.57	5.31	1.00
Consecutive	6	20	9	16.16	4.57	1.86
Group III total	17	19	6	12.52	3.90	0.95
Selected	12	19	7	13.00	3.87	1.12
Consecutive	5	15	6	11.40	3.41	1.52
Groups II and III total	51	27	4	14.07	4.90	0.69
Group IV total	10	19	-2	9.90	6.86	2.17
Selected	5	17	-2	6.20	6.80	3.04
Consecutive	5	19	4	13.60	5.22	2.78

in view of the mandibular configuration noted earlier. With a large mandibular plane angle, some increase in this angle can be expected. It is not tenable to speculate that lack of maxillary growth due to palatal defect could produce stunting of the mandibular ramus, if the 13.70 degree mean for the cant of the occlusal plane of the control group is a true sample of the general population.

TABLE VII. ANGLE OF AXIS OF LOWER INCISOR TO OCCLUSAL PLANE

PATIENT CLASSIFICATION	NUMBER OF CASES	RANGE		MEAN	S.D.	S.D. MEAN
		MAXIMUM	MINIMUM			
Downs' ideal-normals	20	22	8	15.00	3.48	0.78
Non-cleft palate children	25	35	7	19.30	6.80	1.36
Cleft palate children						
Group I total	49	31	-8	11.78	7.53	1.06
Selected	37	29	-8	10.71	5.19	0.84
Consecutive	12	31	5	15.16	7.81	2.25
Group II total	34	23	1	13.52	5.11	0.88
Selected	28	23	1	13.50	5.13	0.97
Consecutive	6	20	8	13.66	5.48	2.45
Group III total	17	22	2	13.00	6.08	1.47
Selected	12	21	3	13.41	4.86	1.40
Consecutive	5	22	2	12.00	8.31	3.71
Groups II and III total	51	23	1	13.35	5.46	0.76
Group IV total	10	25	9	19.70	5.39	1.70
Selected	5	25	9	17.60	6.07	2.71
Consecutive	5	25	15	21.80	3.55	1.59

The Angle of Axis of the Lower Incisors to the Occlusal Plane (Table VII).—This measurement refers to the deviation from 90 degrees of the inferior inside angle formed by the lower incisors and the straight line occlusal plane described above.

Mean values for the cleft palate children were only slightly less than the 15 degree mean of Downs. Increased labial pressure appears to be an obvious explanation for this difference, which would then localize the change to lingual tipping of the lower incisors.

The Angle of Axis of the Lower Incisor to the Upper Incisor (Table VIII).—Reference is made to the inside angle formed by the intersection of lines drawn through the long axes of the upper and lower central incisors. A considerable range (147 to 124 degrees) was noted by Downs. Much larger individual variations are evident in the cleft palate children, and higher values would be expected in view of the occurrence of anterior cross-bites. The measurement was made on seventeen of the fifty-one patients in Groups II and III, since we considered only those cases in which the axial inclination of both central incisors could be determined readily. When the incisor at the site of the cleft was markedly rotated, the interpretation of its inclination in one plane seemed to be of questionable significance. Group IV patients were not considered at all, since premaxillectomy had been performed on one and the remaining central incisors of the other children were badly rotated or displaced.

TABLE VIII. ANGLE OF AXIS OF LOWER INCISOR TO UPPER INCISOR

PATIENT CLASSIFICATION	NUMBER OF CASES	RANGE		MEAN	S.D.	S.D. MEAN
		MAXIMUM	MINIMUM			
Downs' ideal-normals	20	147	124	135.00	5.76	1.29
Non-cleft palate children	25	154	120	132.20	10.20	2.04
Cleft palate children						
Group I total	49	172	119	143.46	13.40	1.94
Selected	37	172	123	146.56	13.32	2.19
Consecutive	12	145	119	133.91	7.12	2.06
Group II total	9	163	135	143.44	9.01	3.00
Selected	6	163	135	144.83	10.66	4.35
Consecutive	3	145	137	140.66	3.27	1.89
Group III	8	168	134	148.88	9.63	3.40
Selected	6	155	142	148.16	5.02	2.23
Consecutive	2	168	134	151.00	16.51	11.60
Groups II and III total	17	168	134	146.00	9.70	2.35

The Angle of Axis of the Lower Incisors to the Mandibular Plane (Table IX).—The approximately 90 degree angle formed by the lower incisors and the lower border of the mandible is probably the most universally accepted relationship seen in cephalometric evaluations. In the cleft palate children the mean values were all negative, indicating retrusion of the incisors. Large positive values were seen in individual cases associated with anterior cross-bites in particular. Here the dental interferences were probably sufficient to offset the restrictive forces of the orbicularis oris muscle complex.

The Angle Classification of Occlusion.—Consideration of the molar relationship alone has been a basic limitation of Angle's method of classification. A more accurate interpretation of the mesiodistal relationship of the dentures is possible if we examine the canine as well as the molar interdigitation. A

TABLE IX. ANGLE OF AXIS OF LOWER INCISOR TO MANDIBULAR PLANE

PATIENT CLASSIFICATION	NUMBER OF CASES	RANGE		MEAN	S.D.	S.D. MEAN
		MAXIMUM	MINIMUM			
Downs' ideal-normals	20	9	- 6	1.0	3.78	0.85
Non-cleft palate children	25	22	- 6	4.4	6.60	1.32
Cleft palate children						
Group I total	50	15	-26	-4.64	8.35	1.18
Selected	38	14	-26	-5.87	8.27	1.34
Consecutive	12	15	- 9	-0.83	7.05	2.03
Group II total	34	11	-13	-1.97	4.89	0.84
Selected	28	11	-13	-2.00	5.24	0.99
Consecutive	6	1	- 6	-1.83	2.71	1.11
Group III total	17	10	-20	-7.29	7.03	1.70
Selected	12	-1	-17	-6.33	4.74	1.37
Consecutive	5	10	-20	-8.00	10.89	4.87
Groups II and III total	51	11	-20	-3.75	6.02	0.84
Group IV	10	8	- 9	-3.70	5.32	1.68
Selected	5	2	- 9	-4.80	3.74	1.68
Consecutive	5	8	- 9	-2.60	5.83	2.61

number of patients, whose molar and canine relationships were different, presented positive histories of premature loss of deciduous molars. No knowledge of dental extractions was elicited from others.

In Group I, Class III molar and/or canine relationships were rare. Only one patient fell in the bilateral mesioclusion category, and even in this case an anterior cross-bite was noted only on the left side. Eight of the fifty patients presented Class II canine interdigitations.

The introduction of alveolar defects (Groups II and III) increased the incidence of Class III cases. Fifteen children (30 per cent) had one or more teeth in mesioclusion. Bilateral Class III molar and canine relationships were seen, however, in only four patients.

Molars and canines were frequently found in distoclusion, but only one patient can be classified as Class II and, since this patient had a mild degree of horizontal overbite, this must be labeled a Class II, Division 2 malocclusion.

No true mesioclusions were seen in the small sample which made up Group IV.

The Overbite.—The vertical overbite was measured from the left central incisal edge. Since a number of patitents had different degrees of horizontal overbite of the central incisors, measurements were made from the mesioincisal angles of both the right and left maxillary incisors.

Deep vertical overbites were found in many cases, but open-bites were rare. The horizontal overbite ranged from a maximum of 10 mm. in Group I to a minimum value of minus 7 mm. in one patient in Group IV.

Cross-bite Relationship.—Eighteen per cent of Group I patients had cross-bites, anterior cross-bites being the most common. Six of the nine patients had maxillary lateral incisors occluding lingual to their mandibular antagonists.

The incidence of posterior cross-bites showed a marked increase when there were interalveolar clefts. A large number of teeth were found in cross-bite in the distal segment of the side with alveolar involvements. The degree of cross-bite was also found to decrease distally; that is, canines were found to be farther palatally situated than second deciduous molars or premolars. Most cases had maxillary first molars in good bucco-lingual relationship, even though cross-bites were present mesially in the same buccal segments.

All Group IV patients were found to have cross-bites. In general, a bilaterally symmetrical distribution of teeth in this type of malocclusion was noted.

Degree of Actual or Potential Crowding.—To evaluate the adequacy of occlusion, it is necessary to determine the proportions between total tooth substance and available osseous base. In this study, this relationship was measured in terms of adequacy of space for premolars. Proper interpretation of these data can be made only by observing the conditions of each quadrant for the individual person, for it is the discrepancy in the *individual* that determines and often limits treatment possibilities. In making these determinations, no allowance was made for potential space which might result from lateral growth.[11, 12] In the younger patients with deciduous occlusions, arches were given a rating of "minimal crowding" when no spacing was present between the deciduous incisors.

In Groups I, II, and III, 40 to 50 per cent of the patients had sufficient space for a full complement of teeth, while 10 to 20 per cent of the patients required space equivalent to the mesiodistal diameter of a premolar in each quadrant. In general, the amount of space required in each upper and lower quadrant was the same, indicating a harmonious skeletal balance. Thus, insufficient room for a full complement of teeth in the lower arch was a frequent finding. In many instances, lack of space could be correlated with premature loss of deciduous molars.

Teeth Congenitally Absent or Extracted.—It was not possible to place under separate consideration the teeth congenitally absent and those that had been extracted, although this would be highly desirable. Histories were too vague to be given credence. When questioned as to why and when teeth had been removed, many parents were surprised to learn that any teeth, especially deciduous molars, had been removed. The incidence of congenitally absent teeth was probably low. A conservative interpretation of the data would be a total of fifteen teeth in the 111 patients examined. The number of teeth which had been extracted was high, considering the age group studied.

Teeth Prematurely Lost Resulting in Space Closure.—The injudicious removal of deciduous molars or premature loss of first molars had resulted in serious loss of space in no less than thirty-two cases (approximately 30 per cent). This emphasized the need for far better routine dental care.

Incidence of Supernumerary Teeth.—Supernumerary teeth were found associated with the site of the alveolar cleft (Groups II, III, and IV). The degree

of differentiation of tooth structure varied from what might be considered vestigial enamel pearls to well-formed crowns and roots. Pegged crowns were common, resembling canine crowns in many instances, though more slender and homologous to the lateral incisor type of tooth in other respects.

Adequacy of Routine Dental Care.—The quality of dental care received by the patients was classified and recorded in Table X. Patients whose mouths were caries free were separated from those who had received dental restorations of any kind. Patients who had no lesions requiring restorations and whose fillings were of high quality were rated "excellent care." "Adequate care" referred to patients whose caries problem was under control with serviceable restorations. Patients who had large virgin cavities, broken filling, and recurrent decay were considered to be getting dentistry inadequate for their needs—a liberal interpretation, by any standard. Group I patients were receiving good dental care at the time of examination; already some had lost important dental units before their caries problem could be controlled. Patients with alveolar defects were getting less dental care, and many parents revealed that the children had been refused treatment by local dentists who did not feel qualified to assume the responsibility for routine dental care of the child with a cleft palate.

TABLE X. SUMMARY OF DENTAL CARE

CLASSIFICATION	GROUP (NUMBER OF PATIENTS, AND PER CENT)			
	I	II	III	IV
Caries-free	12 (38%)	5 (15%)	2 (12%)	0
Excellent care	22 (42%)	5 (15%)	1 (6%)	3 (30%)
Adequate care	6 (12%)	8 (25%)	6 (35%)	5 (50%)
Inadequate care	4 (8%)	14 (45%)	8 (47%)	2 (20%)

Family History.—Of the 111 children included in this study, twenty-four disclosed a positive family history of cleft lip and/or palate. Although many parents knew of no family history of cleft lip or palate, some reported related variations of this syndrome, such as velar insufficiency, absent uvula, congenital cleft lip scar, and excessively high palatal vault. Also reported in some histories were supernumerary teeth and irregularity of the dental arches and of one or more lateral incisors.

Speech Evaluation.—Since a detailed report of the speech results has been published elsewhere,[4] a brief summary of these findings is presented herein.

To describe speech, the following classification was used:

1. Normal, non-nasal speech.
2. Non-nasal speech with minor articulatory defects (the articulatory included are of the type not secondary to a cleft palate, such as lalling, lisping, or infantile sound substitutions).
3. Slight nasality (nasality to such a slight degree that the casual listener would not be concerned over it).
4. Moderate nasality (to the extent that anyone would notice it).

5. "Cleft palate speech" (severe nasality and the type of faulty articulation commonly attributed to an unoperated or poorly repaired cleft palate; rhinolalia aperta).
6. Hyponasal speech (markedly blocked or "adenoidal" in quality; rhinolalia clausa).

Of the total number of 164 children evaluated, 130 (79 per cent) spoke with no nasality and 116 (90 per cent) had no speech therapy other than that given by parental guidance. The greatest incidence of articulatory defects involved the sibilants and occurred in children with alveolar clefts. The majority of these will show improvement following orthodontic treatment, whether they receive speech therapy or not; this is especially true of the children who have normal voice quality.

The most important single factor in the physical production of good speech appeared to be activity of the lateral pharyngeal walls. Without exception, every child with normal non-nasal speech exhibited marked inward, or medially directed, movement of the lateral pharyngeal musculature. No tendency could be found to indicate a relationship between nasality and type of cleft, velar length, or hearing loss.

The best speech results were found when the child's palate was closed before the establishment of a speech pattern and when he had been brought up, from infancy, in an environment which enabled him to have every assistance in his speech development.

History of Orthodontic Treatment.—Of the 111 patients studied, fourteen had had orthodontic treatment or were wearing orthodontic appliances at the time of examination. This number is small and, therefore, does not significantly influence the over-all findings.

DISCUSSION

In the final analysis, successful treatment of the child with cleft palate cannot be based solely on measurable characteristics. A well-adjusted adult, capable of leading a healthy, productive life, must be the ultimate objective. To achieve this goal it is necessary to carry out procedures which will promote normal development and function without interfering appreciably with growth or function, either at the time of intervention or later. The attainment of near-ideal anatomic arrangement of structures may not be the ideal treatment if functions of these parts are neglected during the early formative years. We must also take into consideration the psychologic impact of such gross anatomic defects during the child's early, impressionable years.

The examination of detailed data on individual patients points out the interplay of the many variables which must be considered. It also shows the definite limitations of broad generalization, especially when single factors are considered statistically without being interpreted in the light of other observed characteristics. To discuss the interaction of the multiple factors pertaining to each *individual* patient is not within the scope of this presentation. Despite the

many landmarks and relationships already considered, still other measurements would be necessary for such a differentiation. In fact, other methods of study must be developed before we can interpret with true validity the four-dimensional growth of the cleft palate child. Cephalometric methods which reduce spatial relations of the three planes to a flat film have obvious limitations in this respect. However, the Downs technique of cephalometric evaluation allows us to compare the growing face of the cleft palate child with the "ideal-normal" and the "average-normal" child. A graphic representation of the

Fig. 1.—Summary of cephalometric findings. Solid line represents means for 111 cleft palate patients, broken line represents Downs' ideal-normals, and the dotted line represents twenty-five unselected controls. (From MacCollum, Richardson, and Swanson: *New England J. Med.* 254: 299-307, 1956.)

skeletal profile is shown in Fig. 1. The three projected tracings represent mean values for: 111 cleft palate patients (solid line), Downs' ideal-normals (broken line), and twenty-five unselected average-normal children for controls (dotted line). Since the means of the four groups of cleft palate patients did not differ appreciably from each other, they were combined to produce the solid outline. Although this cleft palate profile differs significantly from that produced from Downs' values, it is important to note that the composite is harmonious in itself. Equally important to note is the similarity between the cleft palate profile and the profile representing the "average-normal" children.

Other investigators who studied lateral films of cleft palate patients have found mean values that should produce similar skeletal profiles.[13, 14] One cranial landmark, the angle of convexity, is a point of disagreement. Graber[13] found a minus 6.2 degree mean in a study of thirty-three cases. A negative

value is detrimental to the profile, perhaps more so than any other single variation from "normal" because of the concomitant aberrations in soft tissue contour. A maxilla distal to the facial plane results in a concave profile and causes the mandible to appear protrusive. With a mean facial angle of approximately 81 degrees, as found in this study and as reported by others, the chin point is definitely not prognathic in relation to the cranial base. This interpretation appears to be valid since the measurements were made with the teeth in occlusion. If the patients also have an increased freeway space (which was not measured in this study), overclosure of the mandible may bring the chin point forward, at least in those patients who had anterior cross-bites. Thus, at rest, the chin point would drop downward and backward, thereby increasing the angle of convexity even more.

The relationship noted between the anterior limits of the maxilla and mandible may become less favorable as growth continues. Björk[15] has shown that the mandible does tend to become more prognathic with age, but the "margin of safety," judging by the mean values for the angle of convexity demonstrated in the present study, should be sufficient to insure balanced faces when these children reach adulthood.

The lingual tipping of the lower incisors has been attributed to the scars of upper lip repair as well as perverted function of the entire orbicularis oris complex. In view of the increase in mandibular plane angle, a decrease in the incisor-mandibular plane angle can be considered a desirable compensatory mechanism.[8]

The common occurrence of cross-bite in cleft palate children cannot be said to indicate restrictions in lateral growth due to surgical closure of the palatal defect. Pruzansky[16] has shown that constriction of the maxillary arch follows the repair of the harelip. Malocclusions very similar to those found among the 111 children under consideration were noted by him prior to palate surgery. The molding influence of the repaired lip results in overriding of the segments, with a predominance of teeth in cross-bite at the mesial ends of the maxilla. The fact that most maxillary first molars erupt in good buccolingual relationship can be interpreted in many ways: (1) it may mean that early surgery does not inhibit the lateral growth in this important area of active bone proliferation prior to the eruption of the first molars; (2) lip surgery causes rotation of the buccal segments (maxillae) so that the distal ends, at which appositional growth will take place, flare outward, resulting in greater maxillary arch width across the first molars; (3) since the nasopharynx is relatively wider than normal prior to repair,[17] sufficient width is maintained despite surgery. In the correction of cross-bites, rapid and successful expansion of the maxillary arch[16, 18, 19] does not lead to breakdown of the surgical repair and has been shown to be due to repositioning of the bony segments; this response suggests that fibrotic contracture of palatal scar tissue is relatively unimportant. Modern surgery, aided by chemotherapy, is bound to result in better repairs than were possible a generation ago when multiple opera-

tions were the rule. Scar tissue in those cases probably contributed to open-bites and excessive tipping of teeth, which made orthodontic treatment difficult and often of very limited benefit to the patient.

An obvious conclusion from this study is the need for better routine dental care for the cleft palate patient, especially during the periods of deciduous and mixed dentition. The surest solution would be for each rehabilitation team to assume the responsibility for such care within its own clinical facilities. This is not economically practical, however, since it imposes a heavy burden of transportation costs on those families who live at any distance from the centers. It is necessary, therefore, to acquaint general dental practitioners with the problems, emphasizing that they do not need special techniques for the pedodontic care of these children, and that they are performing a vital service in the long-range management of the child with the cleft palate anomaly.

SUMMARY AND CONCLUSION

An evaluation of the results of early surgical repair for cleft palate was made on a group of 164 children taken from a larger group of 1,034 patients who had been operated upon at the Boston Children's Medical Center in the last ten years. Detailed dental examinations were completed on 111 of the 164 patients, and are included in this report. It is hoped that other investigators will also make detailed examinations to serve as a basis for comparison of differences in technique and timing.

Facial patterns were studied by means of lateral cephalometric roentgenograms. Analysis of the data on each individual patient was not attempted. Discussion of facial patterns placed emphasis on the arithmetic means of the measurements. This group of 111 cleft palate children had a "composite" skeletal profile: (1) distinctly different from children with "ideal-normal" occlusions, (2) harmonious in itself, (3) differing only in minor detail from twenty-five children chosen at random as being representative of the "average-normal" population, and (4) showing minor differences when classified according to type of original defect.

Examination of the interdigitations of molars and canines revealed that true Class III malocclusions (Angle) were rare. Cross-bites were common in children having clefts involving the alveolar ridge, but this could not be shown to be directly attributable to early palatal closure.

Because the results of early palatal closure have been so satisfactory at the Children's Medical Center of Boston, we plan to continue with this policy. Furthermore, we feel that both the method of closure and the speech-dental program which have been adopted here can be recommended to other clinics dealing with the same probelms.

REFERENCES

1. Graber, T. M.: Craniofacial Morphology in Cleft Palate and Cleft Lip Deformities, Surg., Gynec. & Obst. **88**: 359-369, 1949.
2. Graber, T. M.: Changing Philosophies in Cleft Palate Management, Doctoral Dissertation, Northwestern University Dental School, 1948.

3. Slaughter, W. B., and Brodie, A. G.: Facial Clefts and Surgical Management in View of Research, Plast. & Feconstruct. Surg. **4**: 311-332, 1949.
4. MacCollum, D. W., Richardson, S. O., and Swanson, L. T.: The Habilitation of the Cleft Palate Patient, New England J. Med. **254**: 299-307, 1956.
5. Veau, V., and Borel, S.: Division Palatine: Anatomie, Chirurgie Phonetique, Paris, 1931, Masson & Cie.
6. Downs, W. B.: Variation in Facial Relations: Their Significance of Treatment and Prognosis, AM. J. ORTHODONTICS **34**: 812-840, 1948.
7. Baum, A. T.: Downs' Analysis and Template Transparencies for Application Directly to Cephalometric X-ray Films, Angle Orthodontist **22**: 217-226, 1952.
8. Tweed, C. H.: The Frankfort-Mandibular Plane Angle in Orthodontic Diagnosis, AM. J. ORTHODONTICS AND ORAL SURG. **32**: 175-230, 1946.
9. Johnson, E. L.: The Frankfort-Mandibular Plane Angle and the Facial Pattern, AM. J. ORTHODONTICS **36**: 516-533, 1950.
10. Margolis, H. I.: A Basic Facial Pattern and Its Application in Clinical Orthodontics, AM. J. ORTHODONTICS AND ORAL SURG. **33**: 631-641, 1947.
11. Cohen, J. T.: Growth and Development of the Dental Arches, J. Am. Dent. A. **27**: 1250-1260, 1940.
12. Baume, L. J.: Physiology of Tooth Migration, J. D. Res. **29**: 338-348, 1950.
13. Graber, T. M.: A Cephalometric Analysis of the Developmental Pattern and Facial Morphology in Cleft Palate, Angle Orthodontist **19**: 91-100, 1949.
14. Gilley, F. P.: A Cephalometric Analysis of the Developmental Pattern and Facial Morphology in Cleft Palate, Northwest. Univ. Bull. **48**: 13-15, 1947.
15. Björk, Arne: Same Biological Aspects of Prognathism and Occlusion of the Teeth, Angle Orthodontist **21**: 3-27, 1951.
16. Pruzansky, S.: Factors Determining Arch Form in Clefts of the Lip and Palate, AM. J. ORTHODONTICS **41**: 827-851, 1955.
17. Subtelny, J. D.: Width of the Nasopharynx and Related Anatomic Structures in Normal and Unoperated Cleft Palate Children, AM. J. ORTHODONTICS **41**: 889-909, 1955.
18. Subtelny, J. D.: An Analysis of Orthodontic Expansion in Unilateral Cleft Lip and Cleft Palate Patients, AM. J. ORTHODONTICS **40**: 686-697, 1954.
19. Harvold, E.: Cleft Lip and Palate, AM. J. ORTHODONTICS **40**: 493-506, 1954.

FORCES AND TORQUES ASSOCIATED WITH SECOND ORDER BENDS

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INTRODUCTION

MUCH has been written about second order bends by Angle,[2] Brodie,[3] Strang,[5] Tweed,[6] Wright,[1] and others. In spite of this great amount of written material, however, very little information is to be found on the mechanism of force and torque production. The above writings are limited, for the most part, to descriptions of the technique involved in making second order bends. It is the purpose of the present article to add to the understanding of the action of these bends by presenting a method for calculating the forces and torques associated with them.

PROCEDURE

Fig. 1 represents a passive sectional arch wire consisting of three spans of second order bends marked *a*, *b*, and *c*. This figure has been drawn specifically for the upper left segment and for a sectional arch wire, but the method of

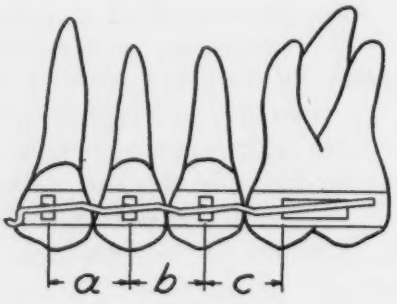

Fig. 1.

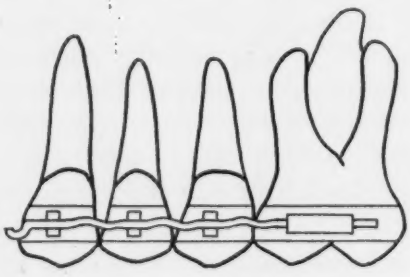

Fig. 2.

Fig. 1.—The relationship of a passive rectangular arch wire to the slots in the edgewise brackets.

Fig. 2.—The elastically deformed arch wire after it is seated in the slots of the brackets.

analysis to be presented holds for any of the four buccal segments and for continuous as well as sectional arch wires. When this arch wire is seated or placed in the brackets, it is deformed elastically as shown in Fig. 2. Such deformation must be accompanied by forces and torques; the magnitudes of these forces and

Based on a thesis presented to the faculty of the Graduate College, University of Nebraska, in partial fulfillment of the requirements for the degree of Master of Science in Dentistry, Department of Orthodontics.

The thesis upon which this paper is based contains extensive theoretical analysis of the second order bends. This analysis is accomplished by use of the elastic energy method. For the sake of brevity in publication, most of the mathematics involved has been omitted from this paper.

torques are proportional to the amount of elastic deformation, provided that the material is not stressed beyond its proportional limit. To calculate the above magnitudes, use is made of the following three mathematical expressions[4]:

1. $M = 6EI \frac{Q}{d}$

2. $F = \frac{2M}{d}$

3. $\frac{Q}{d} = \frac{S}{6Ec}$

where

M = Bending moment or end torque acting as shown in Fig. 3 (pound-inches)

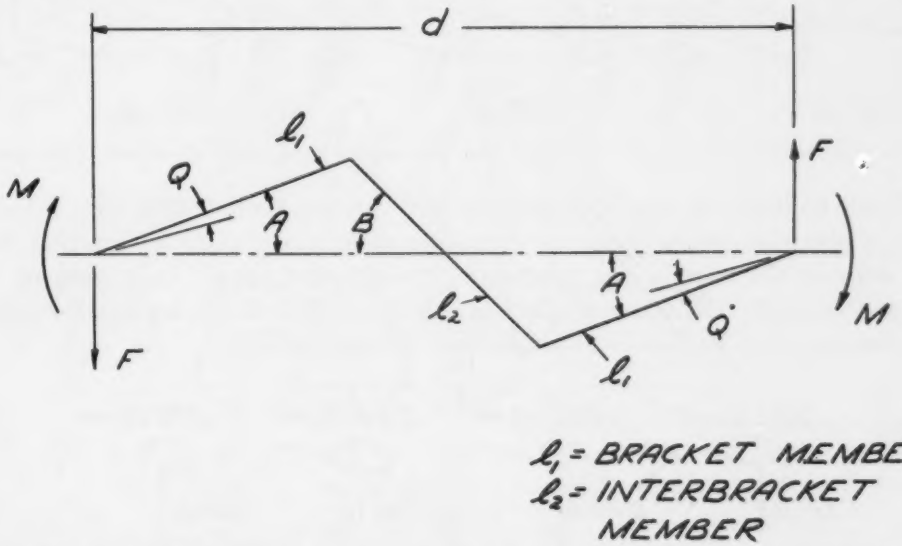

Fig. 3.—A single span of a second order bend. When the span is engaged in the slots of edgewise brackets at the left and right ends, the torque (M), the force (F), and the rotation (Q) are produced.

E = Modulus of elasticity of the material (pounds per square inch)

I = Moment of inertia with respect to the neutral axis (inches to the fourth power)

Q = Angle of rotation of the ends of a span (radians)

d = Span distance (inches)

F = Balancing force (pounds)

S = Proportional limit stress of a given material (pounds per square inch)

c = Distance from the neutral axis of the wire to the outermost fiber of the wire (inches)

Before calculating M, the allowable Q/d ratio for the material in question must be determined from equation 3. For the types of stainless steel generally

used in orthodontics, this Q/d ratio is about 0.085 radian per inch, while for a typical wrought-gold wire it is approximately 0.093 radian per inch. This simply means that the ends of a span can be rotated so many radians per inch of span length without subjecting the wire to a permanent set or deformation. Should the clinician increase the rotation beyond the allowable amount, a permanent set will be introduced into the wire so that the action will be far less effective than expected. Put in another way, the maximum torque that can be created is limited by the strength of the wire.

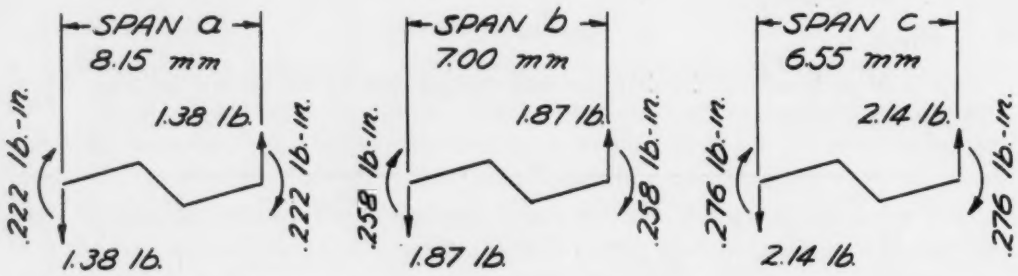

Fig. 4.—The calculated values of the forces and torques for three spans of second order bends.

Upon multiplying the Q/d ratio by the shortest span length (d), a value for Q is obtained which gives the maximum permissible angle of rotation that may occur in the wire at the brackets of the shortest span. In a span of 7.5 mm., for example, the allowed rotation is 0.025 radian or 1.4 degrees for stainless steel and 0.027 radian or 1.6 degrees for wrought gold.

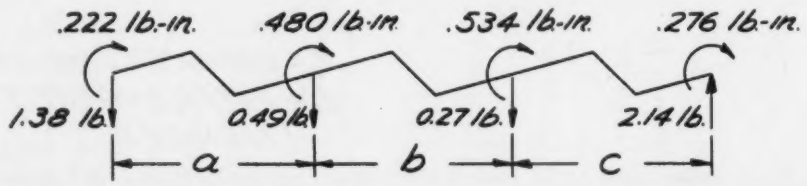

Fig. 5.—The forces and torques acting on a sectional arch wire. The upper left cuspid bracket is at the left end and the upper left molar tube is at the right end.

Equation 1 was derived for the case in which both ends of a span are twisted or rotated the same amount. For analytical purposes, then, the arch wire must be so fabricated that the bracket members shown in Fig. 3 are parallel to each other. This technique of fabrication not only simplifies the work of making the bends, but it also results in a more nearly uniform tooth movement. The interbracket members, however, need not be parallel to each other, inasmuch as it was found[4] that the magnitude of angle *B* shown in Fig. 3 had no practical effect on the torque produced. Furthermore, it was found that for a given span distance (d), the relative lengths of the bracket members and interbracket members had practically no effect on the force action.

By analyzing each span of the sectional wire separately, it is possible to calculate M and F corresponding to the Q/d ratio found from the allowable Q of the shortest span. These torques and forces are given in Fig. 4 for the

three separate spans. When these spans are combined into a single sectional arch wire, using the principle of superposition, the torques and forces acting on the arch wire are found. The results are shown in Fig. 5.

The forces and torques shown in Fig. 5 are those acting on the wire in order to spring it into the slots of the brackets. Initially this force system is brought to bear on the wire by the orthodontist. The force system is then transferred so that it is brought to bear on the wire by the teeth. Now, since the teeth maintain the torques and forces shown in Fig. 5, it follows that the

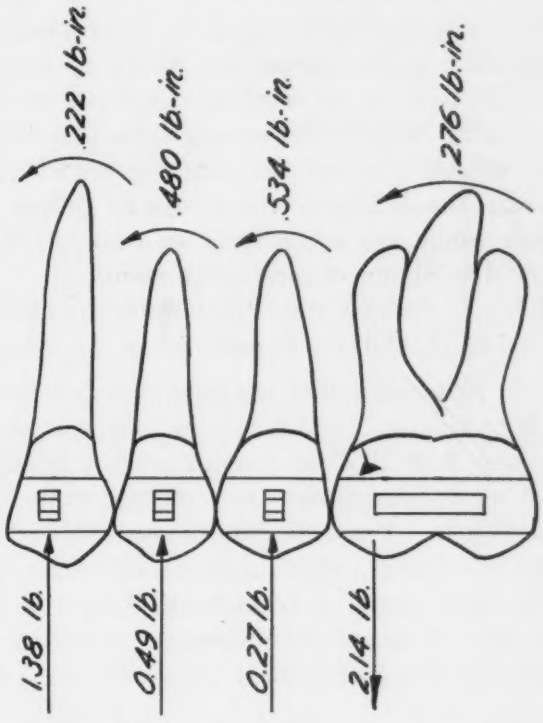

Fig. 6.—The forces and torques acting on the buccal teeth produced by the arch wire shown in Fig. 5.

wire reacts on the teeth with these same forces and torques, but in the opposite directions. The forces and torques received by the teeth are shown in Fig. 6. This is the typical picture of the initial effect that the arch wire has on the teeth. In different cases the magnitudes of the values shown would be different, but the general relationship of the values to each other would be as shown. Also, the values given are initial ones only, because as soon as tooth movement begins the forces and torques start dimishing toward zero value.

DISCUSSION

Force System.—High forces and torques exist when second order bends are used. Under the above conditions the cuspid is being subjected to an intrusive force of 1.38 pounds and a counterclockwise torque of 0.222 pound-inch. Inasmuch as the sole benefit from second order bends is derived from

the torque developed, it would be more desirable if the intrusive force were reduced and the torque increased. That this is impossible, however, is made evident upon examination of equation 2, where it is seen that any increase in the torque (M) must increase F. The premolars, on the other hand, are getting about twice the cuspid torque. At the same time, their forces are relatively small. Thus, a more nearly ideal situation exists here. At the other end of the segment, the first molar, like the cuspid, is subjected to a relatively low torque and a relatively high extrusive force. The molar, if anything, should be subjected to a high torque because of its heavy root structure.

In the illustrative case, span distances *a, b,* and *c* were chosen from G. V. Black's tooth dimensions. In the special case where the spans are of the same length, the first and last teeth in the segment would receive equal and opposite forces, while all the other teeth would receive none. As for torques, the end teeth would receive exactly one-half the torque received by any one of the other teeth. As a rule, the end teeth will always be getting minimum torques and maximum forces, while the other teeth in the segment will be getting maximum torques and minimum forces. The resultant of the forces acting is a couple which balances the sum of all the torques produced. This balancing couple cannot be eliminated, contrary to many ideas expressed on the subject.

Angle Q.—It will be recalled that the allowable Q is small. If measured, it will be found to vary between 1 and 2 degrees. Experience in the fabrication of bends, however, may show that the passive bracket members will cross the slots in the bracket at angles greater than the allowable Q. This angle is designated as *A* in Fig. 3. The difference between A and Q represents the play or looseness in the system, which must be overcome before the bracket members can perform their work. It is doubtful whether angle A ever exceeds 5 to 6 degrees at the start of second order therapy. At subsequent adjustments, when the angle of the bends is increased, it cannot exceed Q without producing a permanent set.

Inasmuch as Q is small, the high forces and torques existing at the initial seating of the wire are reduced in a short period of time. In other words, only a small amount of tooth rotation will inactivate the arch wire.

The Modulus of Elasticity and Moment of Inertia.—In equation 1 it is seen that M is a function of E and I. The larger E and I are, the greater the torque M will be. For stainless steel, type 302, E is about 28,000,000 pounds per square inch, while for a common wrought-gold wire it is 17,500,000 pounds per square inch. Assuming the use of wires of the same size and Q/d ratio, the stainless steel wire would produce a torque 60 per cent greater than the wrought-gold wire. In view of the high forces connected with this type of therapy, the gold arch wire would offer a method for reducing them. This is not meant to imply that gold wire is superior to steel in other respects, however. As far as the moment of inertia is concerned, it may be considered a constant because the 0.021 by 0.025 inch wire is more or less in standard

use. The moment of inertia could be reduced by going to smaller wires, but then a great deal of control would be sacrificed unless the brackets were redesigned.

Number of Spans.—In most cases, the second molars are to be moved distally along with the other teeth in the segment. Since an elastically deformed arch wire stores potential energy which is gradually dissipated through tooth

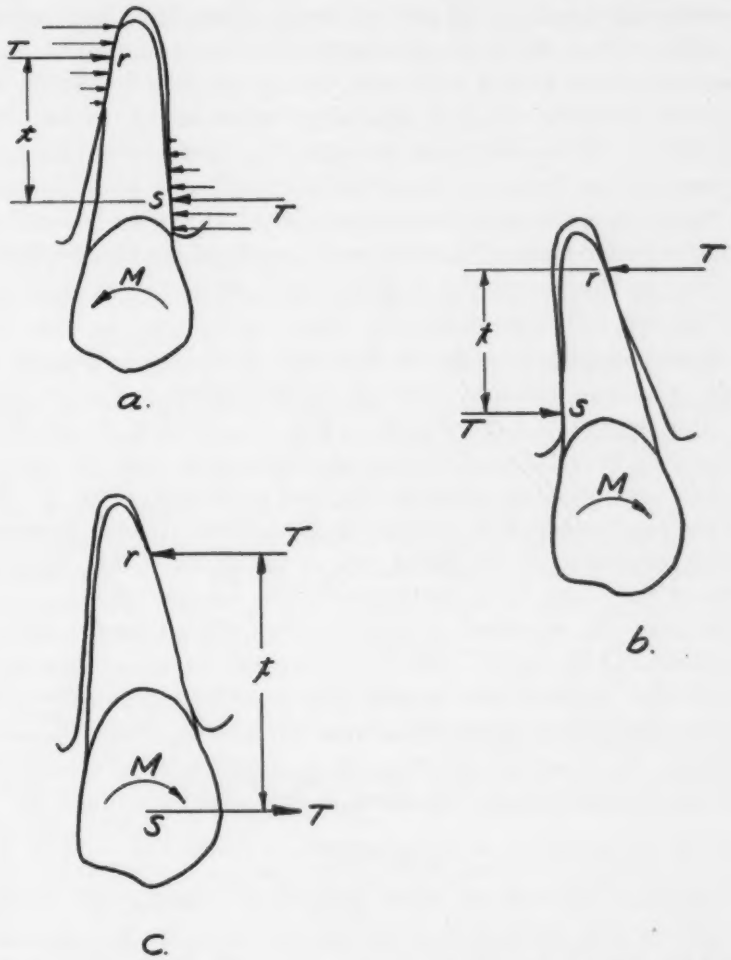

Fig. 7.—*a*, Torque (*M*) gives rise to forces *T* and *T*, thereby causing bone to be resorbed at *s* and *r*. *b*, Torque (*M*) is now reversed, causing undesirable resorption opposite to that shown in Fig. 7, *a*. *c*, In addition to the torque (*M*), a force (*T*) is applied to the crown at the bracket. Resorption now takes place at the distal wall of the alveolus only, thereby permitting the apex to move distally.

movement, it follows that a greater amount of energy could be stored if a greater number of spans could be used. For this reason, it is desirable to band the second molars wherever possible and include them in the therapy.

The Mechanism of Tooth Movement.—Treatment with second order bends usually consists of two distinct stages. The first stage involves moving or tipping the crown distally. The second stage is used to upright the axes of

the tipped teeth, thereby moving the apices distally. The applied torques during the second stage are in the opposite direction to those used in the first stage.

The equilibrium condition of a single tooth acted upon by a counterclockwise torque equal to M, ignoring intrusive or extrusive forces, is shown in Fig. 7, *a*. Let it be assumed that this represents the first stage. The reaction to the torque is a couple represented by vectors *T* at *r* and *s*. These vectors represent the resultant of all the forces which are distributed over the root of the tooth. The maximum intensity of force would exist at the distal alveolar crest and at the mesial surface at the apex. The maximum resorptions would occur here, provided that the physiologic tolerance of the bone to pressure were not exceeded. This resorption permits the tooth to be rotated about a point lying somewhere between the alveolar crest and apex. Such rotation results in a relatively great distal movement of the crown and in a lesser mesial movement of the tooth apex. The arch wire must, of course, be free to follow the crowns. Up to this point, the application of an auxiliary distally directed force is helpful but not necessary.

In the second stage the torque is reversed, as shown in Fig. 7, *b*, by first flattening the wire and later by making reverse bends. The force system is now exactly the reverse of that shown in Fig. 7, *a* and it should be apparent that the movement accomplished during the first stage will be lost. In order to prevent this loss, it is essential to add an auxiliary force at the bracket represented by the vector *T* at point *s* in Fig. 7, *c*. Under these conditions, resorption will take place on the distal wall of the alveolus only, thereby permitting the axis of the tooth to be uprighted. The success of second order bend therapy depends on the presence of this distally directed force applied continuously to the crowns of the teeth. Herein lies a great weakness, because this force is usually obtained through the use of intermaxillary elastics. Such elastics must inevitably displace the opposite dental arch form, which is here called *its neutral position.* To offset this ill effect, at least partially, it would be desirable to include some form of cervical traction in the appliance make-up.

SUMMARY

1. Mathematical expressions were given for calculating the forces and torques brought to bear against teeth by an arch wire containing second order bends.

2. It was shown that the effective rotations which could be incorporated into the wire at any one adjustment varied between 1 and 2 degrees. The initial bends contain larger rotations of the bracket members because a certain amount of play must first be overcome before the teeth could be subjected to torques.

3. In any arch wire containing second order bends, the torques created are balanced by a couple. This couple must intrude the teeth at one end of the segment and extrude the teeth at the other end. The direction or sense of the couple is always opposite to the sense of the torques.

4. The torque received by either end tooth is about one-half as great as the torque taken by any one of the other teeth in the segment.

5. For a given span distance, the relative lengths of the bracket and interbracket members have no practical effect on the action of the wire Furthermore, the angles made by the various interbracket members with the slots in the brackets need not be uniform. The bracket members, though, should be fabricated to be parallel to each other.

6. Large forces and torques can be brought into existence through second order bends. Extrusive and intrusive forces as high as 2 pounds and torques as high as 0.5 pound-inch can act on the teeth immediately following the placement of the wire. These large forces and torques diminish quickly, however, because they are associated with very small angles of wire rotation.

7. Wrought-gold wire, because of its lower modulus of elasticity, would exert a milder action than the usual types of stainless steel used. This is not meant to imply, however, that gold is superior to stainless steel in other respects.

8. The second molar should be included in second order bend therapy. The additional span brought into action permits a greater storage of potential energy in the system which would be available for tooth movement.

9. After the crowns have been moved distally and the uprighting of the axes is begun, it becomes essential to apply a continuous auxiliary force, distally directed, to the arch wire or brackets. Such a necessity represents an inherent weakness in second order bend therapy, because it is difficut to supply such a force continuously without the use of intermaxillary elastics. These elastics have a detrimental effect on the opposite arch, as stable anchorage cannot be found inside the oral cavity.

REFERENCES

1. Anderson, George M.: Practical Orthodontics, ed. 7, St. Louis, 1948, The C. V. Mosby Company, pp. 372-374.
2. Angle, Edward H.: The Latest and Best in Orthodontic Mechanism, Dental Cosmos **71**: 260-270, 1929.
3. Brodie, Allan G.: The New Angle Mechanism, J. Am. Dent. A. **16**: 2085-2108, 1929.
4. Drenker, E. W.: A Force Analysis of Second Order Bends, Thesis, University of Nebraska, 1955.
5. Strang, R. H. W.: A Textbook of Orthodontia, ed. 3, Philadelphia, 1950, Lea & Febiger.
6. Tweed, Charles H.: The Application of the Principles of the Edgewise Arch in the Treatment of Malocclusions, II., Angle Orthodontist, **11**: 12-67, 1941.

219 3RD AVE., E.

THE AMERICAN BOARD OF ORTHODONTICS

The annual Booklet of Information (with the list of certified orthodontists) compiled by the American Board of Orthodontics, has recently come off the press; that reminds us that the readers of the AMERICAN JOURNAL OF ORTHODONTICS are highly interested in the activities of the American Board of Orthodontics. The A. B. O. has this to say in its new booklet:

ORIGIN AND AUTHORITY

At the twenty-eighth annual meeting of the American Society of Orthodontists, held in Estes Park, July 16 to 19, 1929, The American Board of Orthodontia* was created under a resolution offered by Dr. Martin Dewey, chairman of the committee which was appointed to consider the President's address, and adopted unanimously. The resolution follows:

Whereas, the President has recommended the formation of an American Board of Orthodontics similar to the American Board of Otolaryngology and other similar boards formed for the purpose of regulating the specialties of medicine, which boards have rendered valuable service in standardizing and increasing the efficiency of medical specialists; and

Whereas, up to this time those engaged in the practice of orthodontics have had varying and sometimes insufficient qualifications for the practice of our specialty; and

Whereas, the need of a high order of training is essential to orthodontic practice; and

Whereas, there is need of a body to designate standards of study and other qualifications for those who are to represent the specialty of Orthodontics; be it therefore

RESOLVED: That the American Society of Orthodontists create and sponsor an organization to be known as The American Board of Orthodontics, which shall consist of seven men of unquestionable and outstanding reputation and accomplishment in the science of Orthodontics, who shall be appointed by the Executive Committee and elected by the general assembly at large—one to serve for a period of one year, one to serve for a period of two years, one to serve for a period of three years, one to serve for a period of four years, one to serve for a period of five years, one to serve for a period of six years and one to serve for a period of seven years; and one to be elected annually thereafter to serve for a period of seven years. The nominations made by the Executive Committee shall not be voted upon until the following day thereafter. Three-fourths of the votes cast shall be necessary to elect a nominee a member of The American Board of Orthodontics.

The Board shall organize and make rules regarding the requirements for examination of candidates for the granting of certificates of fitness, and to make such other rules and regulations as it may deem necessary for the proper functioning of the Board.

Addendum on Authority.—Rules and regulations directing the operations of the American Board of Orthodontics are based upon the Requirements of Approval of the Council on Dental Education of The American Dental Association.

*In 1939 the name was legally changed to the American Board of Orthodontics.

This agreement between the Board and the Council was consummated Oct. 27, 1950.

CERTIFICATION BY WAIVER

The Board is committed to an agreement that following its 1953 meeting it will no longer be possible to waive examination and certify candidates on their records.

PURPOSES

First.—To stimulate and keep alive the spirit of research and self-improvement among students and practitioners of orthodontics.

Second.—To establish the competence of specialists to practice orthodontics.

Third.—To arrange, control, and conduct examinations for the purpose of testing the qualifications of orthodontists and to confer certificates upon those who meet the established requirements of the Board.

CERTIFICATE—NOT A DEGREE

The certificates granted by the Board are in no sense degrees nor do they purport to confer upon any person any legal qualification, privilege, or license to practice orthodontics, nor does the Board intend to limit the activities of any licensed dentist.

All diplomates are required to understand and agree that titles to certificates are retained by the American Board of Orthodontics, and that such certificates shall be surrendered upon demand by order of the Board, if and whenever the Board deems such action to be in the best interests of professional and public welfare.

VALUE OF CERTIFICATE

Primarily, it will establish in the mind of the holder the assurance that he is maintaining accredited standards of competency in his practice.

Futhermore, the establishment of definite standards of fitness to those anticipating specialization in orthodontics will serve as a genuine stimulus to desire and possess such a symbol of recognition of their ability.

WHO MAY APPLY FOR CERTIFICATION

(NOTE: Changes and modifications may be made in these requirements from time to time.)

The following constitute the eligibility requirements:

(a) Active membership in the American Association of Orthodontists for at least two years.

Citizens of other countries, who have been affiliate members of the American Association of Orthodontists for at least two years and who meet all other requirements, may apply for "affiliate" certification.

(b) Graduation from a dental school accredited or otherwise recognized by the Council on Dental Education of the A.D.A.

(c) A license to practice dentistry issued by a legally constituted examining board or other legal authority.

(d) An exemplary record of professional ethics.

(e) Exclusive practice in orthodontics for at least five years at the time of filing application. In computing this requirement, time spent in full-time training in orthodontics may be included.

(f) Minimum training requirements shall be:

1. Two years' successfully completed graduate or postgraduate orthodontic training in an accredited university school (this means two academic years each of eight months' or more duration); or

2. Eight months' university graduate or postgraduate orthodontic training in an accredited university school plus (a) twelve months' full-time preceptorship in the office of a member of the American Association of Orthodontists, or by spending sufficient time in hospitals, clinics, or fundamental science laboratories recognized by the Council on Dental Education of the American Dental Association and by the American Board of Orthodontics as competent to provide an equivalent adequate training in orthodontics, or (b) twenty-four months' supervisory preceptorship as defined below; or

3. Twenty-four months' full-time preceptorship in the office of a member of the American Association of Orthodontists or its equivalent, including attendance at acceptable special orthodontic courses or in hospitals, clinics, or fundamental science laboratories recognized by the Council on Dental Education of the American Dental Association and by the American Board of Orthodontics as competent to provide an equivalent adequate training in orthodontics; or

4. Twelve months' full-time preceptorship in the office of a member of the American Association of Orthodontists *plus* twenty-four months' supervisory preceptorship or an equivalent to the above which may include the attendance at acceptable special orthodontic courses or in hospitals, clinics, or fundamental science laboratories recognized by the Council on Dental Education of the American Dental Association and by the American Board of Orthodontics as competent to provide an equivalent adequate training in orthodontics; or

5. Forty-eight months' supervisory preceptorship or an equivalent which may include attendance at acceptable special orthodontic courses or in hospitals, clinics or fundamental science laboratories recognized by the Council on Dental Education of the American Dental Association and by the American Board of Orthodontics as competent to provide an equivalent adequate training in orthodontics.

6. Teaching or a fellowship in the field of the specialty may be considered in partial fulfillment of this requirement.

DEFINITION OF PRECEPTORSHIPS

1. *A preceptorship* shall consist of full-time association in the office of a member of the American Association of Orthodontists. Such a preceptor would be expected conscientiously to do all he could to determine the applicant's ability. He would appraise the extent and quality of records for diagnosis and treatment planning and offer proper suggestion for improvement.

A suitable form will be supplied by the American Board of Orthodontics to be filled in by the preceptor to give full and confidential reports on the applicant.

The director of the American Board of Orthodontics located nearest the applicant should be consulted concerning any preceptorship arrangement to establish eligibility for American Board of Orthodontics certification.

2. *A supervisory preceptorship* shall consist of supervision by a member of the American Association of Orthodontists the same as by preceptor described above except that the applicant need not be associated in the office of his preceptor.

Identical provisions shall prevail in regard to forms for confidential reports.

APPLICATIONS, FEES, AND ROUTINE

Application for a certificate of qualification must be made on a special form, which may be procured from the secretary together with other required credentials. These must be filed with the secretary *at least sixty days prior to the next scheduled meeting of the Board.* The application must be accompanied by a fee of $150.00.

The American Board of Orthodontics meets once a year, immediately preceding the annual convention of the American Association of Orthodontists. At this time, it reviews the applications on hand and approves or rejects them. For all those approved, the Board decides upon the requirements for examination and notifies the applicant accordingly. The applicant is expected to have his material for examination prepared by the next annual meeting.

If he is unable to complete these requirements by that time he has the right to petition for an additional year.

If this additional year is granted and he is still unable to complete the requirements, he has the privilege of requesting a final year to do so.

In the event he does not meet his requirements by this final year, his application will be cancelled and his fee forfeited.

Should a candidate file his requirements by the required time and fail his entire examination, or any part thereof, he has the privilege of repeating the full examination, or the part failed, one full year after having taken his first examination and before the expiration of five years.

If, on taking the second examination, he should fail any part thereof, the Board shall stipulate the conditions whereby the deficiency may be removed, including time allowances.

If he should fail his entire re-examination, his application will be cancelled. He may, then, after due preparation, file a new application.

The Board reserves the right to assess a penalty, not to exceed $25.00 per year of extended time, when applicants fail to prepare their material for examination at the time of the annual meeting following notification of requirements, or when extensions of time arise through failure in whole or in part.

REQUIREMENTS FOR A CERTIFICATE

The requirements for the granting of a certificate of qualification will be stipulated by the Board in each case after a careful study of the record of the applicant. In determining these requirements, complete information regarding the following items is essential:

1. Preliminary education.
2. Dental education.

3. Orthodontic education.
4. Graduate and postgraduate study in orthodontics.
5. Teaching appointments in orthodontics.
6. Time of exclusive practice in orthodontics.
7. Contributions to dental and orthodontic literature.
8. Orthodontic clinics and exhibits.
9. Activities in research.
10. Ethical standing in community and profession.

EXAMINATIONS

Examination of candidates for certificates may include any or all of the following:

A thesis (or essay) on orthodontics or an allied field. (It must be one specially prepared for this examination and not one previously presented, published, or offered, as for a Master's thesis or prize essay contest.)

Case reports, to be prepared according to an outline furnished by the Board.

Sets of casts fitted with appliances suitable for treatment of the cases shown.

Personal visits to offices of applicants.

Written or oral examinations.

Clinical presentations.

Laboratory and technique examinations.

USE OF TITLE "A.B.O."

It is considered injudicious to use the honorary title of American Board of Orthodontics on office signs, stationery, legal, and business papers.

Professional experience is helpful in determination of appropriateness in use of the title within good taste and ethical concepts.

THE ALBERT H. KETCHAM MEMORIAL

(Established by the American Board of Orthodontics in collaboration with the American Association of Orthodontists, 1936)

In the passing of Dr. Albert H. Ketcham on Dec. 6, 1935, the profession sustained an irreparable loss. As one of the pioneers in orthodontics, he helped blaze the trail into the unexplored realms of its science, doing his work so well that the burdens of those to follow were greatly lightened.

As a student and investigator, his wisdom and judgment brought benefits to humanity and general helpfulness to his fellow practitioners. No man gave more generously of his time, effort, or ability for the advancement of orthodontics than did Dr. Ketcham. Although handicapped for forty years by physical disabilities, he never faltered in his exacting labors.

To commemorate his achievements, and serve as an inspiration to the advancement of orthodontics, The American Board of Orthodontics created the Albert H. Ketcham Memorial.

The material symbol of this memorial shall consist of an illuminated parchment, appropriately inscribed, to be awarded annually to an orthodontist or some other person who, in the judgment of the Award Committee, has made a notable contribution to the science and art of orthodontics during the current year or some previous period. It is provided that if in any year a candidate satisfactory to the Ketcham Award Committee is unavailable the award shall not be made in that year.

The following have received the Albert H. Ketcham Memorial Award:

1937	John Valentine Mershon Philadelphia, Pennsylvania	1948	Clinton C. Howard Atlanta, Georgia
1938	Alfred Paul Rogers Boston, Massachusetts	1949	William King Gregory New York City
1939	Milo Hellman New York, New York	1951	Benno E. Lischer St. Louis, Missouri
1940	George Wellington Grieve Toronto, Canada	1952	James D. McCoy Beverly Hills, California
1941	Frederic B. Noyes Chicago, Illinois	1953	Spencer R. Atkinson Pasadena, California
1942	Harry E. Kelsey Baltimore, Maryland	1954	Charles R. Baker Evanston, Illinois
1944	Holly Broadbent Cleveland, Ohio	1955	Joseph E. Johnson Louisville, Kentucky
1946	Raymond C. Willett Peoria, Illinois	1956	Leuman M. Waugh New York, New York

DIRECTORS—1956-1957

Presently the Board of Directors of the American Board of Orthodontics consists of the following:

Ernest L. Johnson, '57, President
San Francisco, California
Lowrie J. Porter, '58, Vice-President
New York City, New York
Jacob A. Salzmann, '62, Treasurer
New York City, New York
Wendell L. Wylie, '61, Secretary
San Francisco, California
William R. Humphrey, '59, Director
Denver, Colorado
L. Bodine Higley, '60, Director
Chapel Hill, North Carolina
B. F. Dewel, '63, Director
Evanston, Illinois

Reports

REPORT OF SPECIAL COMMITTEE ON MEMBERSHIP REQUIREMENTS, AMERICAN ASSOCIATION OF ORTHODONTISTS, 1956

THE majority of our Committee has agreed on submitting the following amendment to the By-laws to the Board of Directors:

SECTION 2. ELIGIBILITY OF ACTIVE MEMBERS.

(A) A person who has been in the exclusive practice (as in present By-laws, "exclusive practice" as used in these By-laws shall mean that the member shall not engage in any type of practice other than that traditionally associated with the practice of orthodontics) of orthodontics for at least five years and who is a member in good standing in his local, state, and national dental organizations may be elected to active membership through the constituent society, provided the applicant has:

1. Five years in the exclusive practice of orthodontics, including a successfully completed orthodontic course of a minimum of 1,500 hours in an approved dental school. He must be recommended by two active members in the area in which he resides, or

2. Five years in the exclusive practice of orthodontics, including three consecutive years' preceptorship in full-time association with an active member of the American Association of Orthodontists who has been an active member not less than eight years. He must be recommended by two active members in the area in which he resides.

   a. Notice of the inception and termination of this preceptorship shall be forwarded within thirty days to the secretary of the preceptor's constituent society and the secretary of the American Association of Orthodontists. In addition, the preceptor shall inform the secretary of the constituent society that the applicant has completed the required time of the preceptorship when the applicant makes application for active membership.

   b. Under certain unforeseen circumstances, such as the death of the preceptor, the applicant may apply directly to the Admissions Committee of the constituent society in the district in which he practices for exceptional consideration.

3. All applicants for membership shall be required to have a personal interview with the Admissions Committee of his constituent society. The Admissions Committee of the constituent society may require the applicant to satisfy the committee as to his qualifications by oral or written examination.

The Committee suggests that the Admissions Committee of the American Association of Orthodontists establish uniform rules and regulations under which the Admissions Committee of the constituent societies shall operate.

BROOKS BELL.

This report was made to the Board of Directors, and the following minority report from Dr. George W. Hahn of the Committee was also made to the Directors.

Minority Report

I would like to bring to the attention of the Association the real objective for which not only this committee but the previous committee was appointed. That is, broadly speaking, to set up certain standards or requirements for membership in the American Association of Orthodontists. In attempting to do this, the members of both committees have tended to confuse this objective with the teaching or training of orthodontists. With the exception of the few states now enjoying specialty acts, any dentist may set himself up as a specialist in any branch of dental practice without further training.

As a member of the former committee I was primarily interested in raising the requirements for membership in the American Association of Orthodontists, feeling that when this was accomplished it would gradually lead to an improvement in the quality of orthodontic service rendered by the future members of the Association. The amendment adopted at the meeting in San Francisco in 1955 is the foundation for such improvement. To me, it is the greatest single forward step taken by the American Association of Orthodontists since it was first organized and gives recognition to the fact that there is something more to the practice of orthodontics than the fabricating of orthodontic appliances and the mechanical moving of teeth, which is the general concept now held not only by the laity but by the medical and dental professions as well. With the passing of this amendment, the society has set a standard of which no member need be ashamed and to which we can all point with pride.

The American Association of Orthodontists is the representative body in American Orthodontics. As such, we have a responsibility to the dental profession and to the public not only to set but also to maintain the highest standards of practice. To do this we must begin with our own members and that beginning can only come through careful selection and education.

Looking beyond the matter of qualification for membership in the American Association, it seems that orthodontics generally has come to the crossroads in so far as educational requirements are concerned. Are we, as a profession, going to continue to be satisfied with educating a group of men to change their mechanical tinkering from that of the general dentist to that of the orthodontist or should we not raise our sights and aim for a society of men whose minds are trained and who have the ability to think beyond digital dexterity?

No matter what we write into the by-laws regarding the responsibilities of preceptors, there are a pitiful few who could or would instill in a student the desire to progress beyond the realm of mediocrity, whereas one of the fundamentals of good university training is to stimulate the student to reach for the topmost rung of the ladder and be satisfied with nothing less.

Unless we are determined to lower the requirements for membership in the American Association of Orthodontists, I see no valid reason for either repudiating or changing without giving a fair trial the amendment to the by-laws adopted at San Francisco in 1955.

GEORGE W. HAHN.

REPORT OF CONSTITUTION AND BY-LAWS COMMITTEE, AMERICAN ASSOCIATION OF ORTHODONTISTS, 1956

AS YOU are aware, the by-laws defining eligibility for active membership were amended in 1955 to take effect in 1957. A special committee was also appointed to give further study to the requirements for eligibility to membership in the A.A.O.

This Committee has studied the recommendations of the special committee and submits the following resolutions to implement those recommendations:

Resolution No. 1

RESOLVED, that Chapter I, Sec. 2-A of the by-laws be amended by striking out the presently effective provisions and the pending provisions passed in 1955, and substituting therefore the following:

(A) A person who is in the exclusive practice of orthodontics* and who is a member in good standing of his local, state, and national dental organizations may be elected to membership through his constituent society, provided the applicant had been:

1. Five years in the exclusive practice of orthodontics, including a successfully completed orthodontic course of a minimum of 1,500 hours in an approved dental school. The applicant must be recommended by two active members of the constituent society within whose jurisdiction he intends to practice; or

2. Five years in the exclusive practice of orthodontics, at least three consecutive years of which shall have been in the office of, and in full-time association with, a practicing member of the American Association of Orthodontists. This practicing member shall have been an active member of the American Association of Orthodontists for not less than eight years. The applicant must be recommended by two active members of the constituent society in whose jurisdiction he intends to practice.

   (a) Notice of the inception of this associateship shall be forwarded within thirty days to the secretary of the constituent society of which the senior associate is a member. The senior associate shall inform the secretary of his constituent society of the completion of the three years of associateship.

   (b) Should this associateship be unavoidably terminated, the junior associate may apply for special consideration directly to the Admissions Committee of the constituent society within whose jurisdiction he practices.

*Exclusive practive as used in these by-laws shall mean that the member shall not engage in any type of practice other than that traditionally associated with the practice of orthodontics.

The Admissions Committee of the American Association of Orthodontists shall consist of the director from each constituent society. This committee shall establish uniform rules under which the Admissions Committee of the constituent societies will operate. The chairman of this committee shall be appointed by the president.

(All applicants for membership in the American Association of Orthodontists prior to the 1957 meeting in New Orleans are subject to membership requirements in existence prior to that date.)

Resolution No. 2

RESOLVED, that the directors representing the constituent societies be instructed to act as a committee to draw up and present at the 1957 annual meeting uniform rules under which the admissions committees in the constituent societies shall operate, and that the president shall appoint the chairman of this committee.

The Constitution and By-laws Committee recommends that the proposed amendment to Chapter V, Sec. 6 of the by-laws (Publications Board) be amended by inserting under *Duties of the Editor-in-Chief,* after the words "from the A.A.O. and sectional societies," the words, "and the American Board of Orthodontics," this sentence then to read: "He will receive manuscripts, reports, etc., from the A.A.O. and sectional societies, the American Board of Orthodontics, and other orthodontic literature from other recognized sources, pass on the quality, desirability, fitness, and arrangement for publication."

The Constitution and By-laws Committee recommends that Chapter 1, Sec. 13 of the by-laws be amended by inserting after the first sentence the following:

Application for Service Membership shall be made through the Secretary-Treasurer of the A.A.O. and shall be voted upon at the subsequent meeting of the Association. Service membership shall automatically terminate when such a member is no longer in the above active services.

And, by adding at the end of Sec. 13: "provided they meet the eligibility requirements for active membership." This section will then read:

Section 13. Service members shall be members of the regular corps of the Army, Navy, Air Force, or Public Health Service whose primary duty is in orthodontics. Application for Service Membership shall be made through the Secretary-Treasurer of the A.A.O. and shall be voted upon at the subsequent meeting of the Association. Service membership shall automatically terminate when such a member is no longer in the above active services. Persons who are eligible for Service Membership may become active members by applying for such membership through a constituent society, provided they meet the eligibility requirements for active membership.

Respectfully submitted,
DONALD C. MACEWAN
OREN A. OLIVER, Chairman.

Following presentation of the above report, President Phil Adams made the following announcement:

"The first part of the report, including Resolution No. 1 which relates to the change in the eligibility requirements, will be, by vote of the Board of Directors, laid over for action until next year and will follow the usual channels for amendments of that type by being published in the Secretary's letter.

"Resolution No. 2 (RESOLVED, that the Directors representing the Constituent Societies be instructed to act as a committee to draw up and present at the 1957 annual meeting uniform rules under which the admissions committees in the Constituent Societies shall operate, and that the President shall appoint the chairman of this committee) should be acted upon at this meeting in order that this information shall be available when the previous amendments suggested come up for action at New Orleans."

The question was then asked by Dr. J. B. Franklin as to how this proposed amendment varies from the original one adopted at San Francisco. President Adams replied as follows: "Since you are asking for information, very well, we will try to give it to you. There are two principal differences, as I see it, between the two. The amendment adopted at San Francisco which was to go into operation in 1957 provided for three years of specialization, and that three years did not include graduate study. The first part of the proposed amendment calls for a five-year period, including graduate instruction, so that virtually it is the same thing, if a man had a two-year graduate course, because that would be included in making him eligible in the five-year period. The second part relates to a change of wording. The Committee has changed the wording to *associateship* rather than *preceptorship,* but it is a preceptorship application which requires five years, three years of which shall be spent in the office of an active member of the Association who has been an active member for at least eight years."

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS, AMERICAN ASSOCIATION OF ORTHODONTISTS, 1956

THE Committee appointed by Vice-President Hopkins to report on the address of President Adams wishes to commend our president on the lucidity of his report and on its orderly arrangement. The Committee concurs most heartily in his acknowledgments to his fellow officers and the committees of his administration and particularly the committees more immediately responsible for the magnificent meeting we are now enjoying, namely, the Program and Local Arrangements Committees. At the same time, we are mindful of his own transcendently important contributions, not only to this meeting but to prior ones as well—his masterly grasp of parliamentary procedure, his smooth and orderly conduct of the meeting, his skillful management of liaison with the American Dental Association, and other accomplishments.

Without comment except to approve, we pass over his summary of actions taken at San Francisco, namely, the creation of committees to consider the feasibility and advisability of forming a ladies' auxiliary, to study and recommend procedures in patient transferrals, to consider further the requirements for active membership adopted in San Francisco, and the issuance of a directive to the Committee on Education to survey orthodontic curricula of more than 1,500 hours. We have also noted his specific mention of the reports of the Public Health Committee, the Publication and Editorial Board, and the special committees appointed to explore the possibility of a workshop on cephalometrics.

Coming to his vital comments concerning the Federal Trade Commission, we wish to commend him for the effective steps taken to safeguard the rights and interests of the orthodontic profession. In this matter he suggests that our Association should take formal specific action, instructing our Public Relations Committee and our incoming officers to cooperate with the American Dental Association in every way possible, and that the American Dental Association be informed officially of such action as may be taken at this meeting.

Because of the vital importance of this matter, it seems necessary, for the sake of clear comprehension, that we should repeat here a few of the resolutions that he has reported as being passed or under consideration by the A.D.A.:

1. To seek amendment of the Trade Practice Rules for the Commercial Dental Laboratory Industry of the Federal Trade Commission to indicate that the responsibility for the design, appearance, comfort, occlusion, or fit of a prosthetic or orthodontic dental appliance rests with members of the dental profession and not with the dental laboratory craft.
2. To seek amendment of the *Rules* so that they will clearly describe the proper relation of the dental laboratory to the dentist by declaring that only licensed dental practitioners and other persons authorized by state law may properly deal with dental laboratories.

The next resolution, the Committee feels, merits especially close attention:

3. To refrain from cooperating in the enforcement of the *Rules*, or in promoting the *Rules*, until satisfactory amendments have been presented and approved by the Board of Trustees and House of Delegates.
4. To consider making appropriate recommendations on the possibility of revoking or enjoining the *Rules* if satisfactory amendment has not been made prior to the 1956 annual session.
5. To make its progress in this matter the subject of full report to the August, 1956, session of the Board of Trustees and the annual session of the House of Delegates.

The Committee concurs in the suggestion of the President regarding cooperation with the A.D.A. and that the A.D.A. be informed of our action. At the same time, the Committee counsels that we observe some caution about giving unreserved endorsement to Resolution No. 3.

The President's most excellent recommendation regarding the preparation of a Program Manual is heartily approved as a great forward step not only in facilitating preparations for a meeting, but also in providing an almost certain aid in the progressive building of more and more perfect meetings. If permitted, the Committee would like to suggest that the Committee on the Program Manual be made a permanent and rotating committee, to which would be added each year the immediate past program chairman and the immediate past local arrangements chairman, while the most senior pair of past chairmen would retire.

Respectfully submitted,

Norman L. Hillyer
Ernest T. Klein
B. Edwin Erikson, Chairman.

In Memoriam

R. E. ALLEN

ROBERT E. ALLEN, 69, who had practiced orthodontics in Jacksonville, Florida, for the past thirty years, died July 8, 1956, after a brief illness.

Dr. Allen was born in East Bend, North Carolina, and came to Jacksonville from Staunton, Viriginia. He attended the Salem School for Boys and was a graduate of Vanderbilt University.

He was graduated in 1909 from the University of Maryland School of Dentistry. He practiced dentistry in Virginia for several years before moving to Jacksonville.

A member of the American Dental Association, the American Association of Orthodontists, and the American Board of Orthodontics, Dr. Allen also was a member of the Seminole Club, where he lived, and Florida Yacht Club and Ponte Vedra Country Club.

He is survived by two sons, Drs. R. S. Allen and F. C. Allen, both of Jacksonville; a daughter, Mrs. Rognar Nicholson, Middletown, New York; two sisters, Mrs. J. N. Davis, East Bend, North Carolina, and Mrs. Eula Werner, Huntington, West Virginia; a brother, Dr. Ray Allen, Roan Mountain, Tennessee; and ten grandchildren.

Department of Orthodontic Abstracts and Reviews

Edited by

DR. J. A. SALZMANN, NEW YORK CITY

All communications concerning further information about abstracted material and the acceptance of articles or books for consideration in this department should be addressed to Dr. J. A. Salzmann, 654 Madison Avenue, New York City

Abstracts Presented Before the Research Section of the American Association of Orthodontists, Boston, May 1, 1956

A Serial Cephalometric Radiographic Study of the Anteroposterior Relation of the Maxilla and Mandible in Individuals With Excellent Occlusion of the Teeth: By Don H. Carlson, B.A., M.A., D.D.S., Northwestern University Dental School, Chicago, Ill.

This investigation was undertaken to determine what changes occur in the sagittal relation of the maxilla and mandible during growth. Twenty white subjects—ten boys and ten girls—were studied from age 6 through age 17, by means of cephalometric radiographs obtained from the Bolton Fund, Western Reserve University. Sagittal changes were determined by measuring differences in maxillary and mandibular prognathism and changes in the facial profile. Prior to eruption of the central incisor teeth, points A and B (Downs) were found to be unreliable for serial studies because of modeling resorption which follows eruption. From age 8 through age 17, a slight increase in maxillary prognathism and a greater increase in mandibular prognathism were observed. The increases were greater among boys. The difference in the sagittal relation of the two jaws decreased with growth. The convexity of the profile decreased, with the male profile straightening more than the female. A significant acceleration in growth among boys was observed between the ages of 12 and 13 years. Among girls, lesser spurts were noted in the maxilla from the ages of 10 to 11 and 12 to 14 years and in the mandible from 10 to 12 and 13 to 15 years. Growth changes among girls had ceased at the age of 15 but among boys they were continuing at the age of 17. Variations in increments and rates of facial growth and in sagittal jaw relations were seen among the twenty persons studied.

A Serial Cephalometric Study of Developmental Growth Patterns of Class I and Class II, Division 1 Malocclusions Before and After Orthodontic Treatment Utilizing an Original Method of Analysis: By William D. Berg, D.D.S., New York University, New York, N. Y.

Utilizing serial cephalograms and significant angular and linear measurements, Class I and Class II, Division 1 cases, with and without an upper bite plate, were analyzed before and after orthodontic treatment to determine the qualitative changes that brought about a successful orthodontic result.

Cases were of the nonextraction type; the patients were 11 to 15 years of age.

Method.—Perpendicular lines were dropped to significant points from N-S and to MP so that the morphologic patterns might be read off simply from the serial cephalometric tracing.

Conclusions.—The head of the condyle can move straight upward, upward and backward, and upward and forward in growth.

Cranial changes are part of the pattern of growth. The condylar fossa, as part of the cranium, will move in relation to the head of the condyle to complete the morphologic pattern.

In Class I relationship, most of the movements of the condyle in growth are straight upward, but the condyle can also move upward and backward, as well as upward and forward, depending on the manner of growth of the maxilla and cranium. If the maxilla moves forward and downward, away from PTM, to maintain the Class I relationship, the head of the condyle must swing backward as the mandible moves forward.

Incremental growth of the body of the mandible as the condyle moves straight up, as well as a forward swing of the mandible, will do the same thing.

If the maxilla moves straight down, often to maintain the Class I relationship the mandible must swing backward.

In Class II, Division 1 cases there are several ways in which correction is made:

1. The upper molar moves distally and the lower molar moves mesially, without any help from the cranial structures or the condyle.
2. The upper first molar does not change its position, but the lower molar moves mesially.
3. The upper and lower molars do not change position, but good growth and the mandible swinging forward help to correct the Class II relationship to Class I.
4. In most instances, all these combinations take place to correct the Class II relationship to Class I. There are other instances in which no amount of tooth movement will correct a Class II relationship without changes in the position of the condyle or condylar fossa.

The first permanent molar in the growth pattern seems to remain stable, but orthodontic treatment can tip the upper molar distally or tip the lower molar mesially.

The upper bite plate acts as an adjunct to treatment. It removes the interferences to the potential of growth. It is seen, though, that cases with or without the upper bite plate have similar patterns of growth.

Point A to ANS does not change in dimensions.

Point A to point B decreases when the mandible swings forward.

A Cephalometric Radiographic Study of Tongue Position in Individuals With Cleft Palate Deformity: By T. L. McKee, B.S., D.D.S., Northwestern University Dental School, Chicago, Ill.

An attempt was made in this study to analyze tongue position at physiologic rest, occlusion, and vowel (u) in thirty-one cleft palate subjects, and to compare them to the same tongue position in seven non-cleft subjects. Various cephalometric radiographic techniques were undertaken to disclose the soft tissues of the nasopharyngeal and oral areas. It was finally decided to introduce Iodochlorol into one nostril and to paint a sticky mixture of two parts of barium sulfate to one part of gum acacia in a commercial mouthwash on the median sulcus of the tongue and hard palate.

Observations were made of the position and relation of the tongue by dividing it arbitrarily into apex, anterior third, middle third, and posterior third. These observations included: (1) the relation of the apex to the mandibular incisors, (2) the relation of the anterior third to the hard palate and the maxillary incisors, (3) the relation of the middle third to the hard palate and the high point, and (4) the relation of the posterior third to the soft palate. Also, the positions of the tongue at physiologic rest, occlusion, and vowel (u) were compared to each other. In the same individual, the tongue had a stable reproducible position.

At physiologic rest the apex was generally found against the lingual surfaces of the mandibular incisors, slightly below their incisal edges. At all three positions studied the tongue was carried much higher in relation to the occlusal plane in the noncleft subjects than in the cleft subjects. As the soft palate and palatine uvula moved upward and backward from physiologic rest to vowel (u), the high point of the tongue moved posteriorly with a resultant change in the contour of the dorsum.

Predicting the Mesiodistal Crown Width of Unerupted Maxillary Canine and First and Second Premolars: By James E. Brown, D.D.S., University of Tennessee, Memphis, Tenn.

This research was concerned with devising a diagnostic formula for use in the maxillary arch to predict the mesiodistal width of the unerupted canine and first and second premolars from the central and lateral incisors. Five hundred casts of the permanent dentition were used. There were 200 males and 300 females. For comparison, the males and females were treated as separate entities. The casts selected were free of proximal fillings and malformed teeth, such as peg lateral incisors.

By the use of fine-pointed dividers, the mesiodistal diameter of each tooth, from the central incisor posteriorly to and including the second premolar, was obtained and transferred as an individual measurement to a line on an index card. These measurements were transferred to a tally sheet.

From this information, the mesiodistal diameters of the central and lateral incisors were correlated with the mesiodistal widths of the canine and first and second premolars. The coefficient of correlation was found to be +0.602 for the males and +0.5888 for the females. This is not a very high coefficient of correlation, yet it closely approaches that of other investigators doing similar work in the mandibular arch.

Separate prediction formulas were determined for the males and females.

The formula for predicting the sum of the diameters of unerupted canines and first and second premolars in males is:

$$Y=11.774+0.334\,x.$$

The formula for predicting the sum of the diameters of unerupted canines and first and second premolars in females is:

$$Y=11.196+0.353\,x.$$

The Variations in Skeletal and Denture Patterns in Excellent Adult Facial Types: A Cephalometric Appraisal in Norma Lateralis: By Samuel Goldsman, D.D.S., Indiana University, Indianapolis, Ind.

The purpose of this research project was to investigate and measure the variations exhibited in skeletal and denture patterns of Caucasian adults with excellent faces. Front- and profile-view photographs and cephalometric roentgenograms of faces in occlusion were procured on a total of 160 untreated per-

sons chosen, by perspection, as having better-than-average faces. This sample was critically evaluated by a jury of professional artists, who selected therefrom fifty, whose faces could be considered excellent. The fifty cases were then analyzed for differences between the sexes, and according to the analysis of Downs, the sella-nasion report of Riedel, the vertical dysplasia study of Johnson and Wylie, the assessment of anteroposterior dysplasia suggested by Wylie, and the formula of Tweed—in which mandibular central incisor teeth are related to Frankfort plane.

There were no significant differences between males and females in any of the measurements.

The measurements did not vary significantly from those of Downs' report, except for Y-axis angle and facial angle, which were disposed somewhat more retrognathically. A study of correlations between occlusal plane angle and skeletal/denture measurements of the Downs' analysis showed that this angle was more closely correlated with measurements of the skeletal pattern, tending in most instances to parallel the activity of the skeletal findings rather than those of the denture pattern.

In the sella-nasion study, the measurements did not vary significantly from those reported by Riedel, except for sella-nasion to gnathion and sella-nasion to mandibular plane, which were disposed prognathically in comparison with the findings of Riedel.

Frankfort-mandibular plane angle was correlated with various skeletodenture measurements suggested by Wylie and Johnson, and the results of their vertical dysplasia study were confirmed.

All denture readings showed wide variability, as indicated by the standard deviations and ranges of extremes. While the Tweed formula of 65.0 degrees for mandibular central incisor teeth to Frankfort plane was confirmed by the findings showing a mean of 65.4 degrees, the range of dispersion was wide: standard deviation was ±5.79 and ranges were between 52.4 and 75.0 degrees.

There is some indication that a compensatory mechanism or balancing property functions within the dentofacial complex to preserve the over-all harmony and proportion of facial pattern in this sample of excellent faces. Where one dimension shows an obvious discrepancy, one or more of the others will compensate for this by varying in the direction which will maintain overall facial harmony.

Occipital Force in the Treatment of the Mixed Dentition. By J. Rodney Mathews, University of California, San Francisco, Calif.

A series of more than fifty children with Class II (Angle) malocclusions ranging from the late deciduous through the early permanent dentitions have been treated by the author. Multiple banding of the maxillary teeth with the edgewise appliance was employed. Occipital anchorage was used throughout, except in a few cases with severe open-bites in which cervical traction was used. Varying numbers of teeth were banded, depending on the age of the patient, ranging from four bands (deciduous canines and second deciduous molars) to complete banding in the older children. In all cases, 0.021 by 0.025 steel arches were used during traction. Effort has been made to avoid or minimize distal tipping of the posterior teeth and lingual torquing of the anterior teeth. All cases have been followed with cephalometric films taken on the Broadbent machine, in order to analyze tooth movements. In the past few months correction of close-bites has been instituted toward the end of active treatment with an anterior bite plane in conjunction with occipital traction. This allows the lower posterior teeth to erupt up into occlusion prior to band removal and retention with a passive bite plane incorporated into the Hawley retainer. In

earlier cases, bite opening was not attempted until the bands were removed, a procedure which sometimes makes it difficult to maintain tooth relation while the posterior teeth are erupting up into occlusion.

Findings.—

1. Reduction of the buccal relation to Class I (Angle) was obtained in all cases.

2. It is possible to move both anterior and posterior teeth distally without tipping.

3. Excellence of treatment results is more a function of patient cooperation than of patient age, sex, or sub-type of Class II malocclusion.

4. Treatment time is markedly lessened in the late deciduous or early mixed-dentition.

5. In no case have maxillary second molars been impacted. They do erupt buccal to their normal positions in some cases, and are corrected with the retainer prior to their complete eruption.

6. The resultant direction of force with occipital traction is sufficiently near to that of the occlusal plane, which is not tipped during treatment.

7. The resultant direction of force with cervical traction is approximately at the level of the third cervical vertebra and is thus an excellent adjunct to extrude the anterior maxillary teeth in closing open-bites.

8. This study further suggests the need for multi-banding of sufficient anterior and posterior teeth to stabilize the maxillary arch as a unit during distal tooth movement, and thus assure the correct curve of Spee when the case is completed.

A Radiographic Evaluation of the Temporomandibular Joint in Children Possessing Excellent Occlusion of the Teeth: By James W. Anderson, D.D.S., Northwestern University Dental School, Chicago, Ill.

A radiographic examination of the temporomandibular joint of thirty-five children ranging in age from 5 years 1 month to 12 years 9 months was conducted. Oriented radiographs were obtained through the use of the Broadbent-Bolton cephalometer and the Donovan temporomandibular joint orienting device. Forty-nine various linear and angular measurements were recorded and a statistical comparison was made to the normal adult measurements previously determined.

A midline deviation was present in many of the children chosen as having clinically excellent occlusion of the teeth. The condyle of the child was found to be at approximately the same vertical relation in the cranium as the adult condyle at the rest, occlusal, incisal, and retruded positions. The condyles of the child and of the adult were at approximately the same depth in the cranium at the occlusal, incisive, and retruded positions. However, at rest position the child's condyle occupied a cranial relation anterior to the adult condylar-cranial relation. Generally, the range of condylar movement in the child was greater than in the adult. A proportionally smallar articular fossa and eminence were exhibited by the child when compared to the adult, with the articular eminence of the child being considerably shorter in height. During growth it was noted that porion bears a rather constant relation to the mandibular condyle and that the mandibular condyle moves in a posteroinferior direction when related to the center of sella turcica as the cranial complex develops.

An Electromyographical Comparison of the Temporal and Masseter Muscles of Orthodontically Treated and Untreated Malocclusion of the Teeth: By Ralph E. Karau, D.D.S., Northwestern University Dental School, Chicago, Ill.

This study was initiated to compare temporal and masseter activity of untreated Class II, Division 1 patients with the activity of these muscles in orthodontically treated persons of the same Angle classification. Each group consisted of five subjects. Surface electrodes were attached to the integument over the middle portion of the temporal muscle and over the masseter muscle near the gonial angle of the mandible. Action currents were detected with an Offner electroencephalograph and were recorded on a four-channel crystograph. Subjects performed various gum- and coconut-chewing exercises after physiologic rest position of the mandible had been determined electromyographically. All records were carefully examined for gross aberrations and general characteristics. The gum-chewing myograms were further analyzed by measuring the total amplitude of each muscle in each chewing series.

It was found that, during deglutition and during masticatory function on the ipsilateral side, untreated persons showed more temporal than masseter activity. The situation was reversed in the treated group, the masseter muscles being more active than the temporal muscles. It was also found that in subjects of both groups one temporal muscle consistently showed greater activity, regardless of whether it was functioning on the ipsilateral or contralateral side. Other observations made in this study tended to substantiate the contention that the temporal muscle is best suited for movement and positioning of the mandible and that the masseter muscle is better fitted to function as a power muscle. The results indicate that harmony of the occlusal relations of the teeth, rather than sagittal relation of the mandible to the maxilla, is the primary determinant of excellence of muscular function.

The Effect of Zinc Oxyphosphate Cement Upon the Enamel Following Placement of Orthodontic Bands: By Herbert D. Davidson, D.D.S., Tufts University, Boston, Mass.

This project has for its purpose the detection of any changes that take place in the enamel due to the use of zinc oxyphosphate cement. Cement, whose liquid portion consists largely of phosphoric acid, plays an integral part in orthodontic therapy in instances where fixed appliances are used during treatment. A current belief is that the phosphoric acid is capable of producing deleterious effects on the surfaces of teeth on which orthodontic appliances have been cemented. Since a relatively thin mixture of the cement is used during cementation, to allow full seating of the band, there is a high initial acid concentration in the adhesive.

This study is being carried out in vitro on caries-free premolar teeth. In order to standardize the study as much as possible, the teeth being used are those that are extracted during the course of orthodontic therapy and thus essentially are newly erupted, having been taken from patients ranging from 9 to 14 years of age.

Although some in vivo experiments will be done, the study is essentially being carried out in vitro, largely to rule out any etiological factors other than the zinc oxyphosphate cement. In support of this statement is the fact that, as of this date, the exact cause of carious activity is unknown and if changes are seen during the in vivo study these unknown factors would have to be considered in the final assay of the results.

The method of investigation chosen is microscopic. The instruments being used employ the use of reflected and polarized light and allow for high-power microphotography of the areas of the teeth. These instruments have been put at our disposal by the Metallurgy Department of the Massachusetts Institute of Technology.

At this time these data are still being compiled and thus it is not possible to furnish significant results. It is the hope of the author that the study will be sufficiently advanced to render data of significant importance at the American Association of Orthodontists meeting in April, 1956.

The Progress of Dental Caries Beneath Orthodontic Bands: A Clinical Study: By Galen W. Quinn, D.D.S., University of Tennessee, Memphis, Tenn.

An attempt has been made, using bite-wing radiographs, to determine whether or not dental caries progresses beneath orthodontic bands. Twenty-three permanent posterior teeth exhibiting interproximal caries of the enamel and dentine were covered with orthodontic bands for a period of three to seven months. The age range of the subjects was from 9 to 17 years, with an average of 13.3 years. Sex was almost equally divided. Adjacent or opposing unbanded teeth with similar lesions were used for control teeth. Radiographic exposures were made prior to the banding procedures and at the conclusion of the observation period. These two films were compared to determine if any change had occurred. The processed bite-wing films were enlarged approximately three times on commercial film. From these enlargements, prints were made on Velox F-3 photographic paper, and tracings of the carious lesions were made on mattex acetate. The radiographs and enlargements were studied through a magnifying glass and a reducing glass in a darkened room over a view box transilluminated with both a yellow and a white light.

Results from this study indicate that carries may progress beneath orthodontic bands, but the rate of progress of caries is less rapid in banded than in unbanded teeth.

Effect of Low-Temperature Heat Treatment on the Physical Properties of Orthodontic Wire: By Edward A. Kemler, D. D. S., Northwestern University Dental School, Chicago, Ill.

Stainless steel wire, type 302 of 0.020 inch and 0.025 inch diameter, and 80 per cent nickel, 20 per cent chromium wire of 22 and 23 gauge, were selected for this investigation. The wire specimens were prepared by forming a round loop ⅛ inch in diameter, 1 inch from one of the free ends of the wire. The specimens were tested in a static flexure machine before and after heat treatment and measurements of proportional limit, modulus of elasticity, and modulus of resilience were obtained. Heat treatments in an electric oven were carried out for five, ten, and fifteen minutes at selected temperatures between 200 and 1,500° F. It was found that a low-temperature heat treatment caused an increase in the proportional limit, modulus of elasticity, and modulus of resilience of both types of wire, the increase being greater in the nickel-chromium than in the stainless steel. In both types of wire the proportional limit and the modulus of resilience decreased at high temperatures, while the modulus of elasticity continued to increase. The observed changes in properties were probably due to the relief of internal stresses incurred in the metal during cold working. Optimum heat treatment for the stainless steel wire used was five to fifteen minutes at 700 to 800° F., and for the nickel-chromium it was five to fifteen minutes at 700 to 900° F.

A Radiographic Analysis of Mandibular Position as Related to Posture: By Philip F. M. Gilley, Jr., D.D.S., Tufts University School of Dental Medicine, Boston, Mass.

This study was made to determine whether or not there was a radiographically measurable change in the position of the mandible when the sitting posture of a given subject was voluntarily changed.

The procedures were carried out on Tufts University School of Dental Medicine sophomores selected at random, and included twenty-one persons, all men, ranging in age from 20 to 30 years. For convenience, the Margolis cephalostat, minus ear-rods or other means of patient fixation, was used. A pilot study showed that angular measurements obtained under such conditions could, within certain limits, show statistical significance.

The method was to seat the patient in the cephalostat (without explanation as to the nature of the experiment) and ask him to assume a slouch. Next he was asked to assume his most erect position and finally he was placed in the cephalometric position with fixation. A radiograph was taken in each position, with specific instructions to the patient to close on his posterior teeth while in the cephalometric position. Such instructions, of course, were withheld in the first two positions so that any change in mandibular position could take place naturally. It was felt that the centric relation in the cephalometric x-ray could be used as a constant or control position with each person.

In those radiographs taken without fixation, it was found that peripheral facial landmarks offered the greatest constancy, while internal cranial reference points usually were superimposed so as to be useless. Therefore, the points used in this study were nasion, Downs' A and B points, menton and, posteriorly, Bolton point. Changes in the ANB angle were taken as indicative of an anteroposterior shift of the mandible, while changes in the nasion–Bolton point–menton angle were taken as a sign of vertical change. From the persons studied, it has been shown that there is no regular or constant correlation of mandibular position and posture.

A Cephalometric Radiographic Evaluation of Face Height in Adult Males With Excellent Occlusion of the Teeth: By Herbert A. Lippitz, D.D.S., M.S.D., Northwestern University Dental School, Chicago, Ill.

Cephalometric radiographs of sixty adult males with anatomically excellent occlusion of the teeth were examined. The distance from nasion to gnathion was termed *anterior face height* and the distance from turcica to gonion was designated *posterior face height*. These two vertical lines were segmented by anteroposterior lines designating the maxillary line (ANS-PNS) and the occlusal line. The distances from the points at which the maxillary line intersected the anterior and posterior facial lines to nasion and turcica were termed *anterior* and *posterior upper face heights*, respectively. The distances from the maxillary line intersections with the facial lines downward to gnathion and gonion were termed *anterior and posterior lower face heights*. The lower face heights were divided into maxillary and mandibular heights by the occlusal line. Each of these parts was measured and the mean, range, standard deviation, and coefficient of variation were determined. The linear and proportional relations of many of these parts were statistically evaluated.

The components of anterior face height were found to bear a constant relation to one another. This was not the case with the components of posterior face height. The relation of total posterior to total anterior face height was statistically significant. The mean proportional value was 69.97 per cent. The proportional contribution of posterior face height as compared to anterior face

height is significantly larger than that of children with normal occlusion or persons with open-bite. The vertical parts of the adult male skull which have clinically excellent anatomic occlusion are predictable only in their variability. The total heights are significantly related, but the structure of this total is typified by individual variation of the size of these parts.

Facial Growth in the Macaca Rhesus Monkey With Surgically Produced Unilateral Cleft of the Hard Palate: By B. G. Sarnat, University of Illinois, Chicago, Ill.

Normal sutural, appositional, and endochondral bone growth have been studied. The effects of injury to some of these growth centers has also been observed.

The purpose of the experiment in this communication was to determine the effects on palatal and facial growth of (1) unilateral removal of the oral palatal mucoperiosteum only and (2) unilateral resection (with production of a cleft) of the hard palate, including the mid-palatine suture, in normal growing monkeys. These procedures were designed to decrease not only the blood supply to one side of the hard palate and maxilla, but also the sutural growth activity of the resected area. Seven young growing normal Macaca rhesus monkeys were operated upon, with a postoperative survival ranging from one to thirty-four months. An approximately comparable group of normal unoperated monkeys were used as controls.

It was found that a smooth, thin epithelial-covered scar was present on the operated site in varying amounts, as contrasted to the thick normal mucoperiosteum with its palatal rugae. In every instance, the soft tissue covered a portion of the bone defect. The scar tissue stripped with more difficulty than the normal mucoperiosteum of the opposite half of the palate. The underlying bone was softer on the operated than on the unoperated side.

In those animals in which the bony palate was completely resected unilaterally, the surgical cleft of the hard palate persisted postoperatively in varying degrees from no repair to nearly complete healing. In two animals in which only the mucoperiosteum was removed unilaterally, extensive defects were found not only in the soft tissue scar, but also in the bony palate of the operated side. No correlation could be noted between the extensiveness of the palatal surgery or the postoperative survival, on the one hand, with the extent of the palatal cleft, on the other hand, when the animals were sacrificed.

A comparison of (1) the operated and unoperated sides with each other and of (2) the skulls of the operated animals with approximately comparable unoperated controls revealed neither significant gross differences in growth and development of the hard palate, maxillary arch, mandibular arch, or total face, nor any change in maxillomandibular relationship (arch size and form, occlusion, and tooth relationships).

Thus, within the limits of this experiment, it is concluded that unilateral traumatic surgery in the form of (1) elevation and removal of the mucoperiosteum or (2) resection of the hard palate did not produce a growth arrest in the face which was grossly apparent.

Facial and Neurocranial Growth After Removal of the Mandibular Condyle in the Macaca Rhesus Monkey: By Bernard G. Sarnat, University of Illinois, Chicago, Ill.

Removal of the mandibular condyle in a group of growing monkeys with a postoperative survival period as long as thirty-five months demonstrated

not only that there was a severe lack of growth of the mandible on the operated side, but also that the facial and temporal bone complexes were less developed than those on the unoperated side. Consequently, there was a marked asymmetry of the skull in all its aspects. These studies indicate that (1) removal of the growing mandibular condyle has a widespread influence on not only mandibular, but also facial and neurocranial, growth and (2) the condyle is an integral part of the temporomandibular joint.

News and Notes

1957 Prize Essay Contest, American Association of Orthodontists

Eligibility.—Any member of the American Association of Orthodontists and any person affiliated with a recognized institution in the field of dentistry or associated with it as a teacher, researcher, undergraduate, or graduate student shall be eligible to enter the competition.

Character of Essay.—Each essay submitted must represent an original investigation and contain some new significant material of value to the art and science of orthodontics.

Prize.—A cash prize of $500.00 is offered for the essay judged to be the winner. The committee, however, reserves the right to omit the award if, in its judgment, none of the entries is considered to be worthy. Honorable mention will be awarded to those authors taking second and third places. The first three papers will become the property of the American Association of Orthodontists and will be published. All other essays will be returned.

Specifications.—All essays must be in English, typewritten on 8½ by 11 inch white paper, double spaced with at least 1 inch margins. Each sheet must be numbered and bound or assembled with paper fasteners in a "brief cover" for easy handling. The title of the essay should appear on the "brief cover." Three complete copies of each essay, including all illustrations, tables, and bibliography, must be submitted. The name and address of the author must not appear in the essay. For purpose of identification, the title of the essay, the author's name, together with a brief biographical sketch which sets forth his or her dental and/or orthodontic training, present activity, and status (practitioner, teacher, student, research worker, etc.) should be typed on a separate sheet of paper and enclosed in a plain sealed envelope. The envelope should carry the title of the essay.

Presentation.—The author of the winning essay will be invited to present it at the meeting of the American Association of Orthodontists to be held in New Orleans, Louisiana, May 13 through 16, 1957.

Judges.—The entries will be judged by the Research Committee of the American Association of Orthodontists.

Final Submission Date.—No essay will be considered for this competition unless received in triplicate on or before Jan. 10, 1957, by Dr. J. William Adams, Indiana University, School of Dentistry, Indianapolis, Indiana.

Alton W. Moore, Chairman, Research Committee
American Association of Orthodontists
University of Washington
School of Dentistry
Seattle 5, Washington

American Association of Orthodontists, 1957 Research Section Meeting

Continuing the policy of recent years, the program will consist of a series of ten-minute research reports which may be presented orally or read by title only. All persons

engaged in research are urged to participate in this program, which will be held May 13 through 16, 1957, in New Orleans, Louisiana.

Each participant is asked to prepare a 250-word abstract for publication in the AMERICAN JOURNAL OF ORTHODONTICS. Abstract for publication and the ten-minute oral presentation at the meeting should be carefully prepared to present an adequate description of the import of your investigation.

Forms for use in submitting the title and 250-word abstract of your research will be sent to each dental school orthodontic department and to any individual requesting one. Please send your title and abstract as early as possible, but not later than Jan. 10, 1957, to Dr. William B. Downs, Graham Building, Aurora, Illinois.

Alton W. Moore, Chairman, Research Committee
American Association of Orthodontists
University of Washington
School of Dentistry
Seattle 5, Washington

American Board of Orthodontics

The next meeting of the American Board of Orthodontics will be held at the Roosevelt Hotel in New Orleans, Louisiana, May 7 through 11, 1957. Orthodontists who desire to be certified by the Board may obtain application blanks from the secretary, Dr. Wendell L. Wylie, University of California, School of Dentistry, San Francisco 22, California.

Applications for acceptance at the New Orleans meeting, leading to stipulation of examination requirement for the following year, must be filed before March 1, 1957. To be eligible, an applicant must have been an active member of the American Association of Orthodontists for at least two years.

Middle Atlantic Society of Orthodontists

The annual meeting of the Middle Atlantic Society of Orthodontists will be held Oct. 14, 15, and 16, 1956, at Haddon Hall, Atlantic City, New Jersey. T. M. Graber, Chicago, Illinois, B. F. Dewel, Evanston, Illinois, and Harlan Shehan, Jackson, Michigan, will take over the scientific program. Daniel E. Shehan of Baltimore, Maryland, is president.

Northeastern Society of Orthodontists

The fall meeting of the Northeastern Society of Orthodontists will be held in Hartford, Connecticut, Monday and Tuesday, Oct. 29 and 30, 1956, at the Hotel Statler.

Pacific Coast Society of Orthodontists

The next meeting of the Pacific Coast Society of Orthodontists will be held in Santa Barbara, California, in February, 1957. Definite dates have not been received as yet.

American Institute of Dental Medicine

The next annual meeting of the American Institute of Dental Medicine will take place at El Mirador, Palm Springs, California, Nov. 4 to 8, 1956. The essayists will be Drs. Francis L. Chamberlain, Milton B. Engel, Donald A. Kerr, Helmut A. Zander, and S. I. Hayakawa.

Applications and full information may be secured from the executive secretary, Miss Marion G. Lewis, 2240 Channing Way, Berkeley 4, California.

Angle School of Orthodontics

In the July, 1956, issue of the AMERICAN JOURNAL OF ORTHODONTICS, a photograph on page 557 was identified as the Class of 1903, Angle School of Orthodontics. We have since been informed by Dr. Edwin G. Flint (whose father, D. Willard Flint, appears in the photograph) that the group should have been designated as the Class of 1902.

Notes of Interest

Archie B. Brusse, D.D.S., and H. Carlyle Pollock, Jr., D.D.S., announce the association of Randle J. Gardner, D.D.S., M.S., 1558 Humboldt, Denver, Colorado, practice limited to orthodontics.

Wm. B. Crowl, D.D.S., announces his return from military service and association in orthodontics with J. Mark Trach, D.D.S., 716 Hawley Bldg., Wheeling, West Virginia.

Ralph W. Galen, D.D.S., announces the removal of his offices to 131 Mt. Auburn St., Cambridge, Massachusetts, practice limited to orthodontics.

B. L. Herzberg, D.D.S., M.D.S., and H. M. Stackler, D.D.S., M.S.D., announce a partnership for the practice of orthodontics at 7200 Exchange Ave., Chicago, Illinois.

Dr. Judah M. Horowitz announces the removal of his office to Beverly Towers, 303 Beverly Rd., Brooklyn, New York, practice limited to orthodontics.

Leo B. Lundergan, D.D.S., announces the removal of his office to Suite 305, Slavin Building, 8000 Bonhomme, St. Louis, Missouri, practice limited to orthodontics.

Albert F. MacDougal, D.M.D., announces that Warren W. Bastey, D.M.D., is now associated with him in the practice of orthodontics at 97 Broadway, Bangor, Maine.

George V. Newman, D.D.S., announces the opening of his suburban branch office at 659 Eagle Rock Ave., West Orange, New Jersey, practice limited to orthodontics.

Louis Schwarz, D.D.S., announces the association of George W. Weine, D.D.S., at 39-15 Main St., Flushing, New York, practice limited to orthodontics.

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Forthcoming meetings of the American Association of Orthodontists:
1957—Roosevelt Hotel, New Orleans, Louisiana, May 12 to 16.
1958—Commodore Hotel, New York, New York, April 27 to May 1.
1959—Statler Hotel, Detroit, Michigan, May 4 to 7.

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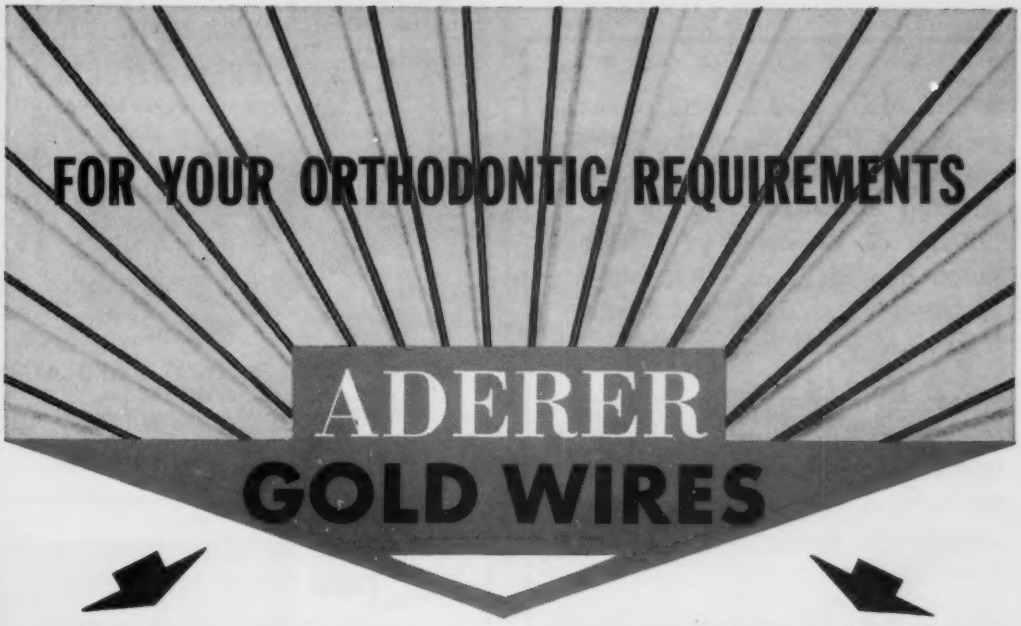

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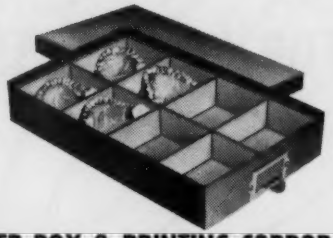

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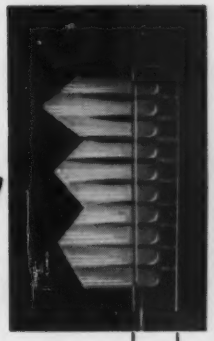

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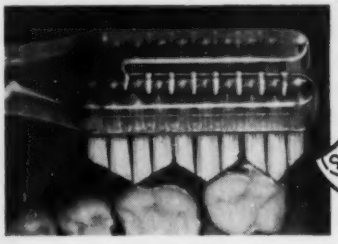

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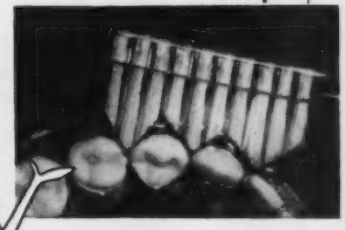

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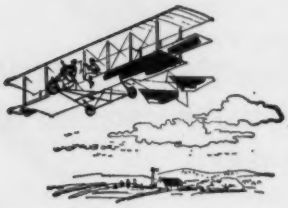

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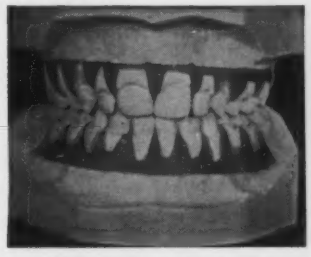

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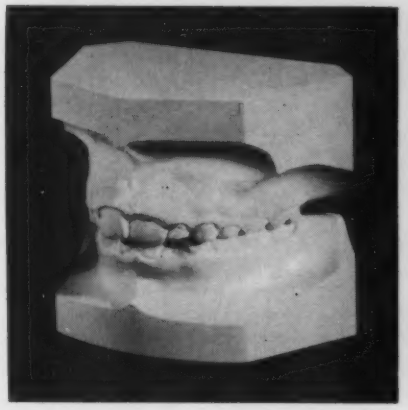

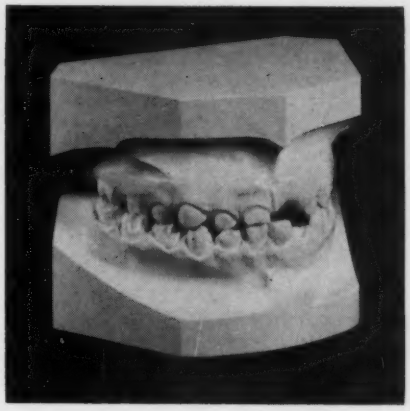

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